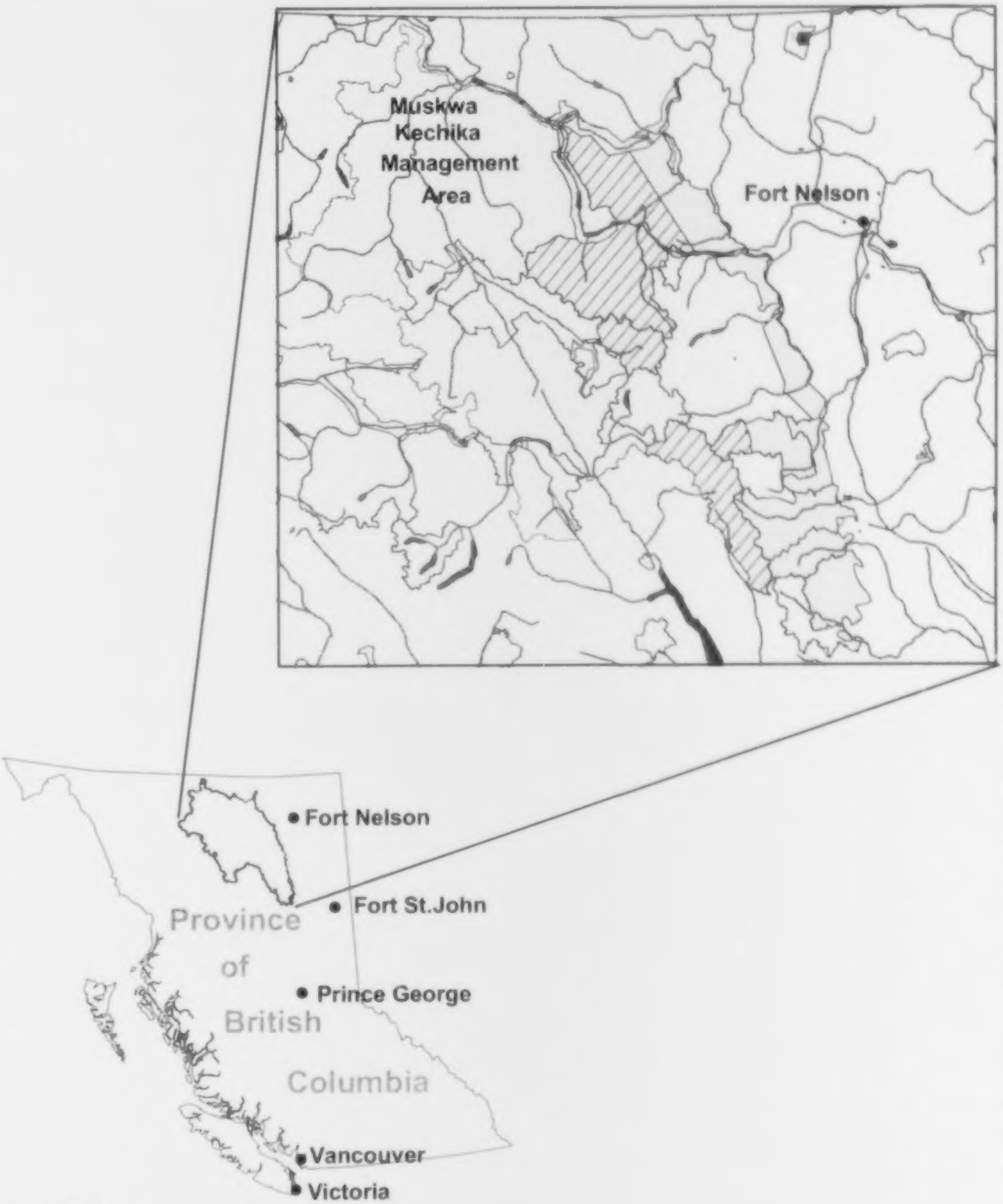
British Columbia

Pre-Tenure Plans for Oil and Gas Development In the Muskwa-Kechika Management Area


Muskwa Kechika Management Area
Fort Nelson
Fort Nelson
Fort St.John
Province of British Columbia
Prince George
Vancouver
Victoria

BC Ministry of
Sustainable Resource
Management

BRITISH
COLUMBIA

June 25, 2003

Dear Reader:

Re: Approval of the June 2003 Pre-Tenure Plans for Oil and Gas Development in the Muskwa-Kechika Management Area

I am pleased to approve this Pre-Tenure Plan for the Muskwa-Kechika Management Area (M-KMA), applicable to the Halfway-Graham and the southern portion of the Muskwa-West areas. The natural gas potential of the M-KMA is significant and the province supports the exploration and development of this resource consistent with the *Muskwa-Kechika Management Area Act.*

This plan draws upon earlier guidance set out in the Fort St. John and Fort Nelson Land and Resource Management Plans. It extends the work in the Besa-Prophet Phase I Pre-Tenure Plan to a new and more accountable approach to resource management. This document establishes a results-based, sustainable resource management framework to guide oil and gas development. Pre-tenure plans are intended to encourage responsible development of the oil and gas resources in the M-KMA in a manner that maintains a range of other natural resource values over time.

The pre-tenure plan also sets out responsibilities for monitoring various activities and outcomes, including the implementation and effectiveness of the plan in achieving its intended results. Establishing quantifiable indicators and targets in a results-based framework is a significant challenge and it is expected that the management direction in this document may evolve gradually, as more experience and new information is obtained. Adaptive management will be used to improve pre-tenure plans over time.

Encouraging investment in oil and gas development involves establishing certainty that the access needed for development is available. This plan provides road access opportunities for both exploration and production of the oil and gas resources of the M-KMA. At the same time, the plan sets clear results to be achieved in planning and managing access as well as restoring disturbances, in part by minimizing or mitigating impacts to other values and uses.

The plan is formatted as a three-ring binder to facilitate future updates. New chapters with management direction specific to other areas in the M-KMA with high gas potential will be added to this document in the coming year. The information and management direction in the existing document may also be revised in the next version of the pre-tenure plans based on ongoing consultations with First Nations and stakeholders.

I would like to thank all of those who participated in the public workshops and other meetings that formed the basis of this document. The contributions received from First Nations, the oil and gas, forest and tourism sectors, conservationists, guide outfitters, trappers, outdoor recreationists, local governments and the public in local communities have all helped us take a significant step forward in achieving the vision of the M-KMA.

Effective implementation is critical to successfully achieving the results described in the pre-tenure plan. I encourage all those with interests in the M-KMA to continue to contribute to this work so that we can achieve the full range of benefits that come from the responsible development intended in the *Muskwa-Kechika Management Area Act*.

Yours truly,

Stan Hagen

Stanley B. Hagen
Minister

PREFACE

The Muskwa-Kechika Management Area (M-KMA) in the northeast region of British Columbia, is a remote and relatively undeveloped area of abundant resources. It is a globally significant wildlife area and supports a diverse range and sizeable populations of large mammals. Beneath the mountains and valleys geologists project a significant potential for major accumulations of natural gas. Encouraging sustainable economic development of the gas resources in a manner that respects and maintains the wilderness and wildlife values of the area is a priority for the government of British Columbia.

Based on recommendations from the Fort Nelson, Fort St. John and Mackenzie Land and Resource Management Plans (LRMPs), the province enacted the *Muskwa-Kechika Management Area Act*. The legislation and the associated Muskwa-Kechika Management Plan require that, prior to the issuance of oil and gas tenures, pre-tenure plans must be developed. The management directions for oil and gas activities contained in a pre-tenure plan become binding caveats on any oil or gas tenures sold.

The purpose of a pre-tenure plan is to encourage and guide environmentally responsible development of oil and gas resources by providing results-oriented management guidance applicable to the M-KMA in general and to specific plan areas. The plan also sets our responsibilities for monitoring various activities and outcomes. Note that a pre-tenure plan is not a prerequisite to conduct geophysical activities; guidelines for conducting geophysical activities in the M-KMA should be sought directly from the Oil and Gas Commission.

The areas requiring pre-tenure plans in the Muskwa-Kechika Management Area are shown in Figure 1. The Upper Sikanni Plan was completed in 1995 prior to the creation of the M-KMA. The Besa-Prophet Phase I Plan was approved in September 2002. The remaining plans, including a revised Besa-Prophet Plan[1], are being finalized in a staged approach with completion dates shown in Figure 1. To reduce duplication in each individual plan and to facilitate inclusion of additional information that may affect all plans in the future, a single binder approach is being used to hold pre-tenure plans for all areas. Inclusion of the Upper Sikanni Plan into this format will be addressed in the future.

Pre-tenure plans will provide greater certainty and guidance to the oil and gas industry on where and how oil and gas operations are conducted. Some Chapters of this binder contain information or management direction applicable to the entire M-KMA. In addition, separate chapters for each planning area contain information and management direction specific to that area.

These pre-tenure plans have been developed with input from government agencies, First Nations, local government, stakeholders and the general public. Considerable effort has been spent on obtaining information on natural resource values and uses for each area on which to base the management direction contained in this document, however it is expected that new information will continue to become available. A collaborative approach to monitoring implementation and effectiveness of the plans and to using adaptive management is also described in this package. Collectively this may lead to amendments to the plans over time.

A glossary is included in the appendices of this binder to explain key terms used throughout the document. The first use of each term explained in the glossary appears in bold letters.

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[1] A revised Besa-Prophet Plan will be the single plan covering all of the Phase I plan area and the area shown with a March 2004 completion date in Figure 1. Tenures sold subsequent to approval of the revised plan will be subject to that plan and not the Phase I Plan.

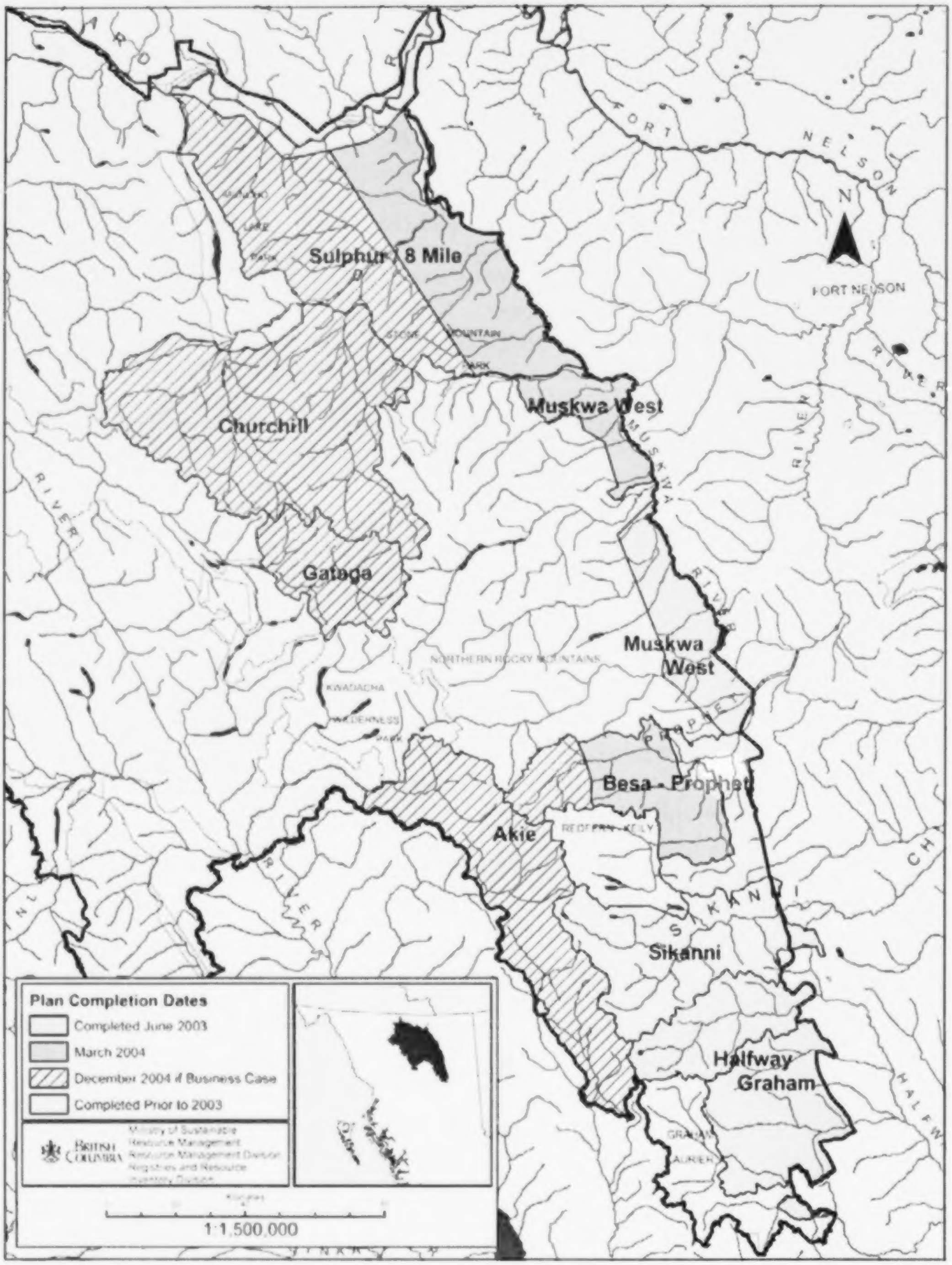
Sulphur / 8 Mile
Churchill
Gataga
Muskwa West
Muskwa West
Besa - Prophet
Akie
Sikanni
Halfway Graham
FORT NELSON
N
NORTHERN ROCKY MOUNTAINS
KWADACHA WILDERNESS PARK
REDFERN - KELLY
Plan Completion Dates
Completed June 2003
March 2004
December 2004 if Business Case
Completed Prior to 2003
1:1,500,000

Figure 1: Muskwa-Kechika Management Area, showing Pre-Tenure Plans

For a larger PDF version of this map, visit: http://srmwww.gov.bc.ca/rmd/ecdev/mog/.

Muskwa-Kechika Pre-Tenure Plans

This document is available on the internet at: http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/index.htm

Plan Updates

Each Chapter of this pre-tenure plan binder is dated at the top of the page. When any part of a plan is updated, the date on that Chapter and this update page will be changed to confirm the most up to date version. The most current dates for each Chapter of the pre-tenure plan binder are:

CHAPTER	DATE
Preface	June 2003
1. Introduction	June 2003
2. Management Vision for Oil and Gas Activities Across the Muskwa-Kechika Management Area	June 2003
3. Management Direction for Oil and Gas Activities across the M-KMA	June 2003
4. Halfway-Graham Pre-Tenure Plan Area	June 2003
5. Besa-Prophet Pre-Tenure Plan Area	completion expected in 2004 (see Besa-Prophet Phase I Pre-Tenure Plan for work in the Phase I area)
6. Muskwa-West Pre-Tenure Plan Area	Southern Portion: June 2003 Northern Portion: completion expected in 2004
7. Sulphur / 8 Mile Pre-Tenure Plan Area	completion expected in 2004
8. Monitoring and Adaptive Management	June 2003
9. Plan Amendments and Variances	June 2003

As oil/gas tenures are sold, they will be subject to the pre-tenure planning management direction applicable to the Muskwa-Kechika Management Area and the specific area of operations on the date of sale of tenure. Please note the staged approach for tenure sales in the Halfway-Graham area (see Chapter 4, Section 4.1.1, for details) and for the Muskwa-West area (see Chapter 6, Section 6.1.1, for details) following approval of this Plan.

Sustainable Management in Pre-Tenure Plans

The sustainable management approach developed for these pre-tenure plans has two linked components. These are:

1. the results-based management framework, and
2. the monitoring and adaptive management system.

For pre-tenure plans to be successful in optimizing the social, environmental and economic values in the planning areas, these two components must be closely integrated. This is particularly true during the initial years of implementation as we learn and focus on continual improvement of the plans.

The results-based framework hinges on setting management objectives and then measuring specific indicators of progress in achieving those objectives. Where possible, targets have then been established as a means of quantifying the acceptable future state of the indicators.

Setting a numerical value on the targets has been one of the most challenging aspects of creating the pre-tenure plans. The science and information behind attempting to quantify short- and long-term impacts of oil and gas activities, and therefore behind the management directions that guide the activities, is imprecise and subjective. As a result, regular monitoring of activities and their outcomes on the ground, and adapting to local conditions or new information, is essential.

This pre-tenure plan sets numerical values to targets as an initial attempt to find the balance that optimizes resource values in relation to oil and gas activities in the M-KMA. Only time and continued analysis will tell if these targets are the appropriate ones. New information and research results will also assist in evaluating the current approaches. With respect to indicators and targets in particular, this document is viewed as a work-in-progress and it is fully expected that incremental amendments may be required in the future to incorporate experience and/or new information. Oil and gas tenures will be subject to the version of the plan that is approved as of the date of sale of tenure.

Chapter 3 provides further information on indicators and targets and Chapters 8 and 9 provide further details on monitoring and plan amendments respectively.

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1. INTRODUCTION

1.1 Purpose of Pre-Tenure Plans (PTPs)

The *Muskwa-Kechika Management Area Act* (the *M-KMA Act*) establishes the requirement for pre-tenure planning for oil and gas exploration and development in the Muskwa-Kechika Management Area (M-KMA) prior to the disposition of petroleum and natural gas rights. Pre-tenure plans are intended to:

- encourage and guide environmentally-responsible development of oil and gas resources by providing results-oriented management direction that ensures oil and gas activities are consistent with the *M-KMA Act*;
- provide a sustainable resource management framework to address social well-being, environmental conservation and economic prosperity, and
- identify roles and responsibilities for ongoing monitoring of progress in achieving the results anticipated by the pre-tenure plan.

Chapter 2 entitled "Vision" outlines broader, longer-term outcomes expected of oil and gas activities in the M-KMA. The oil and gas industry should be aware of these broader goals and contribute to achieving them as they implement their exploration and development activities.

Within certain Chapters of this document the sections entitled "Management Direction" are binding, results-based requirements that must be achieved in oil and gas activities. Oil and gas tenures issued in the M-KMA will be subject to this Management Direction. The results-based framework attempts to quantify the Management Direction to achieve an acceptable future state for social, environmental and economic values in the M-KMA in relation to oil and gas activities. This quantification is based on current knowledge and professional judgment and is viewed as a work-in-progress that may change over time as new information and experience is gained (see Chapter 3 for more details).

The appendices to this document provide additional information to assist interpretation and implementation of the plan by the oil and gas industry and government officials.

The Province acknowledges that pre-tenure plans will not limit treaty negotiations or settlements.

The Province regards participation by First Nations in the development of the pre-tenure plans as an opportunity both to share information with the Province about their interests in the planning area and for the Province to attempt to address and/or reach workable accommodation of these interests. In that sense, the Province regards First Nations' involvement in these planning processes as a form of consultation. At the same time, the Province remains committed to carrying out further consultation to meet its obligations to First Nations respecting specific land and resource development proposals.

Pre-tenure plans apply only to oil and gas activities. As such the management direction in these plans is not legally binding on other resource development activities (such as mineral exploration and mining, forest development, etc.). Authorizations for those activities will be issued in accordance with the relevant legislation and in recognition that those activities may have very different needs and impacts on other values (in development planning or access requirements for example). Coordination of both the use and development of access amongst industrial users will be required of the oil and gas sector in pre-tenure plans; other M-KMA strategic plans or legislation can require coordination of access needs by other industrial sectors.

1.2 Muskwa-Kechika Management Area

The M-KMA was established in late 1997 following approval of the Fort Nelson and Fort St. John Land and Resource Management Plans (LRMPs) in October 1997. In 2001, a portion of the Mackenzie LRMP was added to the M-KMA. These LRMPs, covering approximately 20.8 million hectares of northern BC, led to a range of designations across the land base, including parks and resource management zones addressing special, general or enhanced resource management directions. Within this broader context, the M-KMA comprises parks where oil and gas resource activities are not allowed, and special management zones, where oil and gas exploration and development is permitted.

The LRMP documents are the strategic land use plans that set out a vision for environmental conservation, land-use certainty and economic diversity and stability in the area. They provide over-arching management objectives and strategies for the various special management zones in the M-KMA. These LRMP documents are available on the Ministry of Sustainable Resource Management website at: http://srmwww.gov.bc.ca/rmd/lrmp/index.htm

Pre-tenure plans are being completed in those portions of the M-KMA underlain by the Western Canadian Sedimentary Basin and thought to have potential for the discovery of conventional gas or oil resources. Figure 1 shows the key plans being completed during 2003 and 2004.

Pre-tenure plans in other portions of the M-KMA will be completed once a business case supports doing so. These areas are located west of the "western edge of conventional hydrocarbon potential" as shown in Figure 1-2. The Ministry of Sustainable Resource Management should be contacted if there are interests in having these plans completed.

More information on the M-KMA can be found on the Ministry of Sustainable Resource Management website at: http://srmwww.gov.bc.ca/rmd/lrmp/mk/mk0301/index.html
or on the Muskwa-Kechika Advisory Board website at: http://www.muskwa-kechika.com/

1.2.1 Legislative Framework

The Act establishes the requirement for pre-tenure planning for oil and gas exploration and development in the M-KMA prior to the disposition of petroleum and natural gas rights. Pre-tenure plans are considered a local strategic plan under Section 5(1)(a) of the *M-KMA Act* and Section 7(2)(b) of the Act specifies that oil and gas operational activities must be consistent with the pre-tenure plan. Local strategic plans must be consistent with the Muskwa-Kechika Management Plan (M-KMP), which is established as a regulation under the Act.

A copy of the *Muskwa-Kechika Management Area Act* can be found at:
http://www.qp.gov.bc.ca/statreg/stat/M/98038_01.htm

A copy of the Muskwa-Kechika Management Area Plan can be found at:
http://srmwww.gov.bc.ca/rmd/lrmp/frtnelsn/app7/app7toc.htm

The preamble of the Act identifies the M-KMA as an area of unique wilderness of global significance and outlines the following management intent with respect to oil and gas activities:

> *"... to maintain in perpetuity the wilderness quality, and the diversity and abundance of wildlife and the ecosystems on which it depends while allowing resource development and use........ including .... oil and gas exploration and development."*

Sections 7.0 to 10.0 of the Muskwa-Kechika Management Plan specify objectives for management. Local strategic plans are expected to meet the objectives and strategies of the Management Plan, however it is also recognized that feedback from local strategic plans may lead to amendments to the Management Plan. The Management Plan provides for certain authorizations approved prior to the Management Plan coming into force to be exempt from the Management Plan.

The General Management Direction in the Management Plan conveys three main points:

- *The management intent for the M-KMA is to ensure wilderness characteristics, wildlife and its habitat are maintained over time, while allowing resource development and use, including .... oil and gas exploration and development.*
- *The integration of management activities especially related to the planning, development and management of road accesses within the M-KMA is central to achieving this intent.*
- *The long-term objective is to return lands to their natural state, as much as possible, as development activities are completed.*

The Management Plan provides further management intent and direction through direct references to the relevant LRMPs. This pre-tenure plan document directly addresses the three points shown above; furthermore, the LRMP documents were heavily relied on in creating this document to ensure consistency with the objectives and strategies outlined in the Management Plan.

Other local strategic plans (i.e. recreation management plan, wildlife management plan, park management plans and landscape unit objectives for timber resources) are also identified in the *M-KMA Act* and the Management Plan, however these plans do not contain management guidance specific to oil and gas activities.

It is government's role to ensure consistency amongst these plans such that other local strategic plans will inform the creation of pre-tenure plans and any future amendments. The Oil and Gas Commission is expected to be aware of all local strategic plans in the M-KMA and the resource values and uses they address. The only local strategic plan the oil and gas sector must comply with to meet the requirements of the *M-KMA Act* is a pre-tenure plan.

The disposition of oil and gas tenures is governed by the *Petroleum and Natural Gas (PNG) Act*, administered by the Ministry of Energy and Mines. Tenures will be subject to the management direction contained in this pre-tenure plan. Otherwise, oil and gas activities are subject to all other applicable legislation and regulations. The Oil and Gas Commission regulates oil and gas activities and pipelines in British Columbia.

Section 8.2 of the *M-KMA Act* specifies that pre-tenure plans are not a pre-requisite to the approval and conduct of geophysical exploration in accordance with Part 4 of the *PNG Act*. As such, management direction for geophysical activities is not included in pre-tenure plans. The Oil and Gas Commission is developing a stand-alone document outlining management guidelines for undertaking geophysical activities across the M-KMA, consistent with the *M-KMA Act*. (See Chapter 8 for additional information regarding the monitoring of new surface disturbances from geophysical activities in relation to the results-based framework of this Plan.)

1.2.2 Resource Values and Uses

The M-KMA comprises approximately 6.4 million hectares (1.6 million hectares in parks and 4.7 million in special resource management zones) of remote and largely unroaded lands in northeastern BC.

The M-KMA is widely recognized as having very high wilderness values. The area encompasses boreal plateau to mountain ecosystems that support a diversity of wildlife habitats and populations. The area has the greatest combined abundance and diversity of wild mammals in North America and it comprises a significant, intact predator-prey system. Wildlife species that inhabit the area include moose, caribou, grizzly bear, wolves, Stone's sheep, mountain goat, elk and many species of furbearers. Also, the area supports the only wild plains bison population in the province.

The majority of the main watercourses contain sportfish, primarily Arctic Grayling, Lake, Bull and Rainbow Trout.

The predominant natural disturbance agent in the area is wildfire followed by natural erosion processes (e.g. landslides). Due to the relatively undeveloped condition of the M-KMA, comparatively natural functioning predator-prey relationships continue.

Year-round human activities within the area include guide outfitting, resident hunting, trapping, camping, trail riding, hiking, snowmobiling and wildlife viewing/research. First Nations continue to hunt, fish, trap and pick berries and other vegetation in the area.

The eastern parts of the M-KMA overlap the Western Canadian Sedimentary Basin and have potential for natural gas discoveries. Conventional gas resources are predicted to occur in three distinct ages of rock formations, each with different gas pool sizes and resource estimates. Figure 1-2 identifies the western extent of this potential; future discoveries in older rocks further west may lead to interest in exploring these areas. Excluding recent preliminary oil and gas exploration in the Upper Sikanni PTP area, there are no proven significant oil and gas reserves in the M-KMA at present; however, significant production and reserves are documented in key rock formations outside the M-KMA and gas discoveries have led to some production in the Upper Sikanni area.

Mineral exploration and mining activity has been present in the M-KMA since the turn of the century. Within the area of pre-tenure plans, metallic minerals (e.g. lead-zinc, copper) and industrial minerals have been the prime exploration targets and mining has occurred in some locations.

The portions of the M-KMA where pre-tenure plans are being developed have traditionally been used by First Nations. These First Nations include signatory Nations to Treaty Number 8 including the Fort Nelson, Prophet River, Halfway River, Blueberry River, West Moberly and Saulteau First Nations, as well as the Kaska Dena First Nation. Important archaeological and cultural sites exist throughout the area, but for confidentiality reasons, pre-tenure plans do not spatially identify this information.

Commercial timber values are present in limited areas of those parts of the M-KMA with pre-tenure plans. These are located in the Halfway-Graham area, the Muskwa-West area and in pockets in the Sulphur / 8 Mile area.

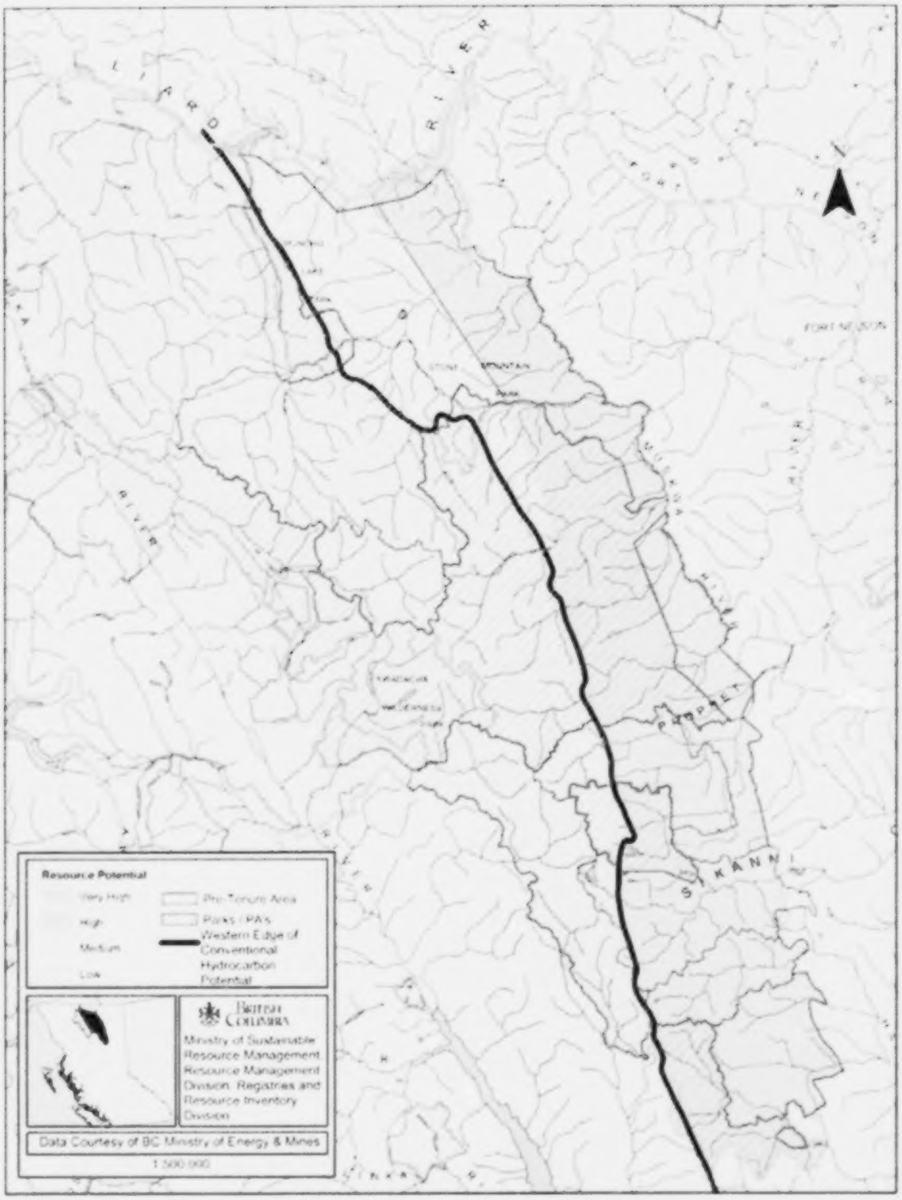
LIARD
RIVER
FORT NELSON
MUSKWA RIVER
PROPHET
SIKANNI
Resource Potential
Very High
High
Medium
Low
Pre-Tenure Area
Parks / PA's
Western Edge of Conventional Hydrocarbon Potential
British Columbia
Ministry of Sustainable Resource Management
Resource Management Division, Registries and Resource Inventory Division
Data Courtesy of BC Ministry of Energy & Mines
1:500 000

Figure 1-1: Natural Gas Potential of the M-KMA

For a larger PDF version of this map, visit: http://srmwww.gov.bc.ca/rmd/ecdev/mog/

1.3 Planning Methodology

1.3.1 Planning Process

Pre-tenure plans have been developed by a provincial government Pre-Tenure Planning Working Group during 2002-03, incorporating input from a wide variety of interests (see Section 1.3.5 for specifics regarding First Nation participation). Public Advisory Groups were assembled to provide input to the government Working Group during pre-tenure plan workshops held in Fort St John and Fort Nelson. Two series of workshops were held. The first permitted participants to express their interests and discuss what was required to be addressed in pre-tenure plans. The second workshops provided an opportunity for participants to discuss the draft pre-tenure plans. A broader First Nation and public consultation period was held during April and May 2003.

1.3.2 Plan Structure and Format

This plan follows the general format of a "binder" with different Chapters applicable either to the entire M-KMA or to specific pre-tenure plan areas. Information applicable to the entire area can be found in the Introduction and in Chapters 2 and 3 dealing with the "Vision" and the "Management Direction" for the M-KMA. Following this, a Chapter for each planning area provides information on resource values and uses unique to that area as well as management direction responding to those unique values and uses. The final part of the plan addresses monitoring and adaptive management, and the plan amendment and variance procedures. The appendices provide additional information to assist in interpreting and implementing this document.

This document creates a sustainable resource management framework to undertake oil and gas activities in the M-KMA. The results-based management direction for oil and gas proponents is comprised of two parts, both of which are requirements for proponents:

- general planning and management direction, and
- management direction.

A results-based format is used to describe outputs that industry is required to deliver from the planning and management direction, and targets that industry is required to meet from the management directions. Within the management directions, key values are identified and management objectives are set for these values. Guidance on achieving the objectives is then refined by specifying indicators to be used for measuring whether an objective is being achieved and setting targets or outcomes for those indicators. This format is illustrated in greater detail in Chapter 3, Management Direction for Oil and Gas Activities across the M-KMA.

1.3.3 Information Sources

The best available information was used in creating pre-tenure plans. Additional information will become available in the future (e.g. conservation area design, new natural gas resource discoveries and estimates) and will be accommodated in pre-tenure plans via an ongoing process of plan adaptation and amendment as required (refer to Chapter 9, Plan Amendments and Variances).

Existing spatial data were used to identify resource values and uses and to create a single "biophysical zone map" for each pre-tenure plan area. The biophysical zone map was created as a "roll-up" map to collectively represent a range of biophysical values. Specific sets of spatial data or "value layers" were chosen to create this map; where experience showed multiple value layers largely overlapped (e.g. winter range capability for multiple species), only one or a few value layers were chosen to be representative of the larger data group. This biophysical zone map provides fundamental information for creating the management direction for each pre-tenure plan area.

The spatial data or "value layers" used in creating the biophysical zone pre-tenure plan maps (see Section 1.3.4) included:

- Predictive Ecosystem Mapping
- Mountain Goat winter range capability
- Rocky Mountain Elk winter range capability
- Moose winter range capability
- Stone's Sheep winter range capability
- Caribou winter range capability
- Bison winter range capability
- Sensitive Site Series
- Slope classifications
- Seral Stage distribution
- Forest Cover

While not used to assist with biophysical zone delineation, other information was reviewed when developing management direction, particularly with respect to wilderness. This other information included:

- Oil and gas potential
- Recreation Opportunity Spectrum
- Visual Quality Objectives
- Noise Impacts
- Existing Tenures (e.g., guide outfitting, trapping, forestry, oil and gas)

Values that do not include a biophysical entity in their definition, such as wilderness and cultural values, were not mapped and were therefore discussed in general terms. However, some non-biophysical entities include spatial components. For example, the extent of non-natural change that can occur on the landscape and still be considered "wilderness" is largely subjective, and difficult to define. However, Visual Quality Objectives and the Recreation Opportunity Spectrum, both spatially defined attributes, are used in this pre-tenure plan to assist in determining wilderness.

All of the information identified above has been used in developing the management directions included in this pre-tenure plan.

1.3.4 Biophysical Zones

As previously mentioned, the biophysical zone map delineates zones or areas with similar sets of values. Biophysical zones rely heavily on habitat capability. In Chapter 3, habitat capability classes underlie some of the results-based management direction that an oil and gas operator must adhere to. The strong correlation between biophysical zones and habitat capability means that the biophysical zone values shown in Table 1-1 are fundamental to creating the management direction in Chapter 3. Monitoring of impacts from oil and gas activities to the biophysical zones is a responsibility of MSRM (see Chapter 8, Monitoring and Adaptive Management, for more information).

Note: Three of the described biophysical zones do not occur in the two pre-tenure plan areas included in this document. They are the Wetlands - High Elevation, Mosaic and Incised Stream Biophysical Zones. However, these zone descriptions are included as they are applicable to future pre-tenure plan areas.

Table 1-1: Biophysical Zones Used in Pre-Tenure Plans

Biophysical Zone	Description
Wetlands - Low Elevation	Concentrated in valley bottoms and lowland areas. Consists of seasonal and year-round moisture saturated soils; watercourses and coniferous/deciduous forest patches can be dispersed throughout the wetland. Contains summer and critical winter habitat for moose, critical caribou habitat and high fisheries values. Various other wildlife species such as raptors, birds, rodents, furbearers, amphibians and reptiles inhabit this zone. High fisheries values are also found within this zone. The wetland zone is important for maintaining water quality and quantity. Contains existing recreational, heritage and commercial tourism trails.
Wetlands - High Elevation	Located in mid to high elevation valley bottoms. Consists of seasonal and year-round moisture saturated soils. Minimal if any coniferous forest within or adjacent to this zone. Contains summer moose habitat, critical caribou winter habitat and year-round furbearer habitat.
Mosaic	Contains a mixture of forested and open habitats interspersed with wetlands, meadows, and forested lowlands and hills. The zone provides a mixture of foraging and security cover for ungulates. It contains critical winter habitat for moose and caribou; as well the older forested stands provide habitat for furbearer species. **Note**: Besa-Prophet Plan only.
Incised Stream	Consists of steep-sloped stream-banks with flat upland areas. Important values include riparian habitat, fish, wildlife movement corridor and water quality and quantity. A mixture of ungulate security and foraging cover primarily on the uplands with a minor component on the steep slopes. Critical moose and elk winter habitat on the upland region. Soils are generally unstable and a terrain stability assessment will be required to determine the feasibility of locating sites or routes for oil and gas activity in this zone. **Note**: Besa-Prophet Plan only.

Biophysical Zone	Description
Warm Aspect Forest (<45% slope)	Consists of both extensive tracks of coniferous tree species and open forested habitat on south-west aspect slopes of gentle to moderate sloped terrain and contains area of old growth. Depending on the pre-tenure plan area, this zone can provide critical winter elk habitat depending on snow depths. Older forest stands are important year round habitat for a variety of furbearers, while younger willow stands provide critical winter moose habitat. Spring grizzly bear habitat is found on steeper slopes that experience early snowmelt. This zone is often the main location of existing trails used by guide outfitters and other recreationists and is often the location of First Nation traditional use.
Cool Aspect Forest (<45% slope)	Consists of wet and cool forests that occur on gentle to moderately sloped terrain. Some forest stands may be interspersed with smaller interconnected wetland complexes. Older forested stands contain critical winter caribou habitat and important year round habitat for a variety of furbearer species, while shrub areas provide critical moose habitat. Pockets of permafrost are found on north slopes in this habitat type. This zone is a wildlife movement corridor.
Steep Slope Warm Aspect (>45% slope)	Consists of open and forested habitat on steep, southwest facing slopes. A variety of terrain features and habitat types are found in this zone including: alpine meadows, old growth forested stands, parkland, young forests, cliffs, rock outcrops and talus slopes. Furbearers are found in this zone. Steeper slopes are primarily open and provide critical winter Stone's sheep habitat and important year round goat habitat. This zone also provides elk and moose winter habitat and, birthing and rearing areas for Stone's sheep, mountain goat and caribou. Due to year round big game populations in this zone, it is the focus of the guide and outfitting industry. Higher zone elevations have lower biological productivity.
Steep Slope Cool Aspect (>45% slope)	Consists of open and forested habitat on steep, northeast facing slopes and pockets of permafrost are found on north slopes. A variety of terrain features and habitat types are found in this zone including: alpine meadows, old growth forested stands, parkland, young forests, cliffs, rock outcrops and talus slopes. This zone is primarily mountainous terrain, highly visible throughout the plan area and, critical winter Stone's sheep habitat borders a large portion of this zone. Steep slopes offer security habitat for caribou, elk and moose. This zone is important as a wildlife movement corridor, for Grizzly bear denning and furbearer habitat. Higher zone elevations have lower biological productivity.
High Elevation Plateau	Consists of high elevation plateaus, often surrounded by steep open and treed terrain. The plateaus are primarily open and consist of vegetation types that are particularly sensitive to disturbance due to low biological productivity, shallow soils and low moisture and nutrient conditions. Isolated pockets of coniferous forest are found on some plateaus. These areas are prone to strong winter winds and provide critical winter caribou habitat especially during winters of high snowfall.
Forested Floodplain	Low elevation zone and adjacent to the River Zone. Forested Floodplain zone width variable, dependent on valley bottom topography. Forest cover dominated by conifers. May contain stable side/back water channels. Provides foraging, security and thermal cover for a diverse range of wildlife, including: elk, moose, bear, variety of furbearers, raptors and songbirds. In several areas this zone contains existing recreational and commercial tourism trails; it will also typically contain First Nation trails and sites.

Biophysical Zone	Description
Glacier	Areas that have year-round accumulations of ice and snow that exclude the establishment of any vegetation. During summer months, various ungulate species may use accessible portions of glaciers to mitigate high ambient temperatures and/or to seek a reprieve from blood sucking insects.
River	Stream flow varies throughout the year with peak flows generally occurring late spring and early summer. Year to year, the active channel can change location within this zone. High fisheries values exist in this zone. May contain forested islands.
River Breaks	Consists of actively eroding unstable steep-sloped banks of various heights and lengths bordering watercourses.
Caribou	High elevation areas known to provide critical winter caribou habitat due to the availability of terrestrial lichens. Bounded by the 1400m elevation contour and incorporates the High Elevation Plateau Biophysical Zone and portions of the Warm/Cool Aspect Forest and Steep Warm/Cool Aspect Biophysical Zones. **Note:** Eastern Portion of the Halfway-Graham PTP only.

1.3.5 First Nations Participation

During the initial stages of pre-tenure plan development, the Ministry of Sustainable Resource Management (with other agencies) identified First Nations that have an interest in a particular plan area within the M-KMA and subsequently approached them to discuss their participation in the pre-tenure process. This included members of the Treaty 8 First Nations and the Kaska Dena First Nation

The two public workshops held for each plan were attended by several First Nations representatives. These representatives indicated there would be a need for additional government-to-government discussions between the provincial government and their respective communities. In several instances, presentations by provincial government staff of map products were made to various First Nations land planning staff. This permitted those First Nations an opportunity to review map products and discuss areas of traditional importance prior to the initial public workshop. Following the second set of public workshops, discussions occurred with several First Nations, including the Halfway River, Fort Nelson, Prophet River, West Moberly and Saulteau First Nations. During the First Nation and public consultation period meetings were held with Halfway River, Prophet River and Kaska Dena First Nations.

Some First Nations indicated they were unwilling to participate in the creation of a pre-tenure plan as a matter of principle. These First Nations indicated their position was similar to that taken when the LRMPs were created. The Ministry of Sustainable Resource Management ensured that these First Nations received all relevant information regarding the development of the plan and upcoming workshops and that the lines of communication were kept open, in the event these First Nations decided to change their position.

Participation of Treaty 8 and Kaska Dena First Nations in the workshops reflected the large area discussed in those workshops. This June 2003 version of the pre-tenure plan document only addresses the Halfway-Graham area and the southern portion of the Muskwa-West area. As such it does not overlap with Kaska Dena asserted traditional territory. For this reason, issues raised by the Kaska Dena First Nation during the consultation process are not included in this document, but are being held for inclusion in the next version of the document.

1.3.6 Economic and Social Considerations

Pre-tenure plans are intended to facilitate the best overall combination of uses of the Crown land and resources in the M-KMA consistent with the *M-KMA Act* with respect to oil and gas activities. The Fort St. John and Fort Nelson LRMPs confirm that opportunities for environmentally responsible development of surface and subsurface resources are to be maintained or enhanced in the special management zones of the M-KMA where pre-tenure plans are being developed. The LRMPs provide guidance that development should respect sensitive natural values by minimizing impacts and returning lands to a natural state over time. Pre-tenure plans recognize this direction and are concerned with enabling the province to obtain the benefit of oil and gas resource development opportunities while maintaining existing resource uses and values. This approach is expected to secure a more prosperous and diverse economy, for local communities and the province as a whole.

Current resource uses in the area include First Nation traditional uses, guide-outfitting, trapping, and recreation (non-commercial hunting, fishing, hiking, etc.), as well as some mineral exploration activities. There is potential for expanding commercial forestry and commercial tourism in the M-KMA. Natural gas exploration and production is present in the Upper Sikanni area.

The economic implications of these activities have been recognized in the planning process and used in developing the management directions. Basic "building-blocks" of socio-economic information on various sectors compiled by the Ministry of Sustainable Resource Management have underpinned this thinking; those building blocks are available on the Ministry website at: http://srmwww.gov.bc.ca/rmd/ecdev/analysis/index.htm

Through careful management as provided by this plan, the sum total of these values can be enhanced. There is significant potential for increased benefits from new oil and gas activities, although this may imply a reduction in other sector values at least temporarily.

Pre-tenure plans are not designed to set objectives and targets for provincial benefits from oil and gas resource development in the same manner as objectives and targets are set for maintaining resource uses and values. However, monitoring and reporting on the benefits that accrue from oil and gas development are essential to determine if the over-arching goals of the pre-tenure plan are being met. Chapter 8 expands on this and sets responsibilities for the Ministry of Sustainable Resource Management, in collaboration with the Oil and Gas Commission and the Ministry of Energy and Mines, to track and report on economic benefits derived from oil and gas development in the M-KMA.

1.4 Access Corridor Planning and Management

Access management is one of the most critical factors in achieving pre-tenure plan goals. Both the Fort Nelson and Fort St. John LRMPs clearly expressed the intent for industry to have the opportunity to access and develop oil and gas resources. At the same time, the LRMPs were clear that access must be well planned and impacts associated with surface access must be minimized in a manner consistent with the intent of the *M-KMA Act*. Discussions on access typically raise the most polarized debates during public consultation on pre-tenure plans.

Pre-tenure plans provide an opportunity for seasonal and all season surface access, for both exploration and production activities. The plans recognize the Oil and Gas Commission is open to considering the use of heliportable drilling technology in the M-KMA. To the extent practicable, winter season access is encouraged for initial exploration activities, as a means of reducing impacts, but it is expected that some activities will require all season access. Any access proposal must be justified to the Oil and Gas Commission. Pre-tenure plans provide specific guidance on a wide range of issues affecting access, including coordination, consultation, planning, environmental impacts and access use management; any development plan must consider all these issues as part of a proposal for authorization of activities.

The concept of identifying access corridors in pre-tenure plans as a means of reducing conflicts and increasing certainty amongst all parties has been raised during pre-tenure planning meetings. This concept has not yet been fully developed or specifically tested in a particular pre-tenure plan area, but there is sufficient merit in the concept to warrant further work.

The mountainous terrain in most pre-tenure plan areas lends itself to discussions on access corridors. Surface access, when required, will be limited to valley bottoms for much of their route. Similarly, many historical and current uses and values are focused in valley bottoms due to similar access constraints. Discussions on this topic recognized that the main valleys generally trend east-west while geology and gas structures cut across this trend. Finding agreement on access corridors is expected to focus on the main valleys, however it is recognized that development proposals will include "spur" access routes off these main valleys.

The primary intent of identifying access corridors within pre-tenure plans would be to identify these different uses and values, along with the biophysical and other values found in valleys, and to seek a conceptual level of agreement amongst all parties that if surface access is proposed, then it must be aligned within an identified corridor where conflicts with other values are shown to be reduced. If this goal can be achieved consistent with the *M-KMA Act*, then there is value in identifying access corridors in main valley bottoms to the extent that conflicts can be demonstrably minimized.

Defining access corridors does not imply pre-approval of any surface access proposal. Each proposal would be reviewed on its own merits in consideration of all requirements of this pre-tenure plan and other applicable legislation. Access corridors also do not imply that surface access is the only form of access possible; consideration of alternative options for access is encouraged within the adaptive management approach included in this plan.

1.4.1 Access Corridors: Next Steps

Pre-tenure plans scheduled for approval in spring 2004 (see Figure 1 in the Preface) offer many more opportunities to review and test options for access corridors. The Ministry of Sustainable Resource Management will specifically review the access corridor concept during the ongoing planning for the M-KMA with a view to identifying some areas where the access corridor concept can be tested and implemented in future pre-tenure plans. Input will be sought on this during future discussions with pre-tenure planning Public Advisory Groups and with First Nations to further refine the details of what an access corridor would comprise. Coordination of access amongst all users of the area will remain a key priority in any such work. In the interim, prior to access corridors being further defined, applications for access will be assessed by the Oil and Gas Commission consistent with the provisions of this plan.

2. MANAGEMENT VISION FOR OIL AND GAS ACTIVITIES ACROSS THE MUSKWA-KECHIKA MANAGEMENT AREA

As identified in Chapter 1, the M-KMA is a unique area and the *M-KMA Act* and Management Plan lay out a vision for the area. The Muskwa-Kechika Advisory Board also has a stated vision for the area, available on their website at:

http://www.muskwa-kechika.com/who/index.html

The special management zones in the M-KMA require that special measures will be used when working in this area. This management vision reflects the interests of First Nations, industrial and non-industrial stakeholders and various levels of government with interests in the M-KMA. Pre-tenure plans build on this to provide a management vision for oil and gas activities that considers all the resource values and uses in the area.

Effective implementation of pre-tenure plans will be based on using this vision to guide expectations and activities in the M-KMA. As such, anyone working in the M-KMA should understand and commit to achieving the overall vision as identified in the following elements. None of these elements should be read in isolation; together they comprise an overall vision.

2.1 Elements of a Management Vision for Oil and Gas Activities

- The M-KMA is an area established to maintain in perpetuity the wilderness quality, and the diversity and abundance of wildlife and the ecosystems on which it depends, while allowing resource development including oil and gas exploration and development.
- Investment in oil and gas exploration and development is encouraged in the area and activities are undertaken in a responsible manner that respects the interests of First Nations, governments and stakeholders.
- Development and use of the M-KMA's natural resources are optimized in a manner that respects First Nation interests, stimulates the economy, provides jobs, conserves ecosystem integrity, sustains a diversity of lifestyles and enhances community well-being for area residents and all British Columbians.
- Effective planning ensures oil and gas activities are coordinated with other users and all impacts are minimized, based on environmental, social and economic considerations.
- Progressive reclamation of surface disturbances no longer needed for development activities restores biophysical and resource values to their natural state as much as possible such that pre-development values and uses can be sustained over time.
- There is a shared responsibility to use innovative approaches to working in the M-KMA; management guidance continually improves through a process of integrating new information, monitoring, adaptive management and incremental plan amendments as required.

3. MANAGEMENT DIRECTION FOR OIL AND GAS ACTIVITIES ACROSS THE MUSKWA-KECHIKA MANAGEMENT AREA

The management direction to proponents of oil and gas developments is structured in a "sustainable management framework" that focuses on results that are to be achieved by the proponent.[2] The overall goal is to optimize social, economic and environmental values, such that any benefit to one value does not come at an unacceptable expense to either one or both of its counterparts. Assessing performance is a critical aspect of ensuring all values remain in the optimal field portrayed in Figure 3-1.

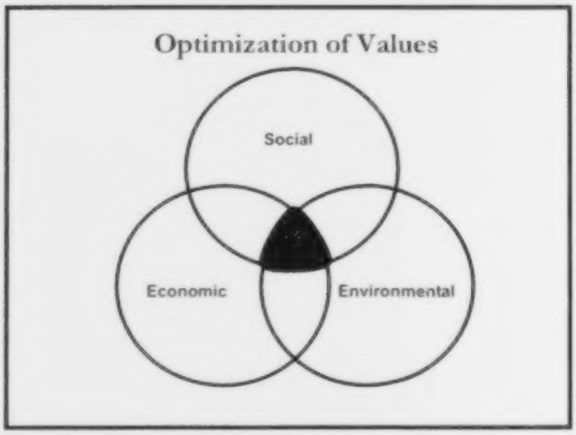

Figure 3-1: Optimizing Resource Values

Achieving this optimization is a shared responsibility among a number of parties (including proponents, government, third party auditors, etc.) and a management system has been created to outline the roles and responsibilities of each party (see Chapter 8, Monitoring and Adaptive Management). For a proponent of oil and gas activities, the sustainable management framework focuses on outputs or products that must be delivered, and results that must be met, expressed as targets.

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[2] The approach used in this document follows a general framework for sustainable management performance developed within the Fort St. John Forest Practices Code Pilot Project. It has been adapted and modified considerably to meet the needs of pre-tenure plans.

Outputs

In implementing the sustainable management framework, certain outputs are to be created as a result of planning and management methods undertaken by the proponent.

Examples of outputs include development plans, records of consultations and reports of measurements of physical disturbances in the field. These outputs are required to document that a responsible approach is taken in proposing and carrying out activities and that progress in achieving the specified targets is fully reported. In many cases, the outputs will be used in the overall management system by other parties who have responsibilities for managing values that extend beyond the scope of an individual oil and gas proponent (such as monitoring ecosystem health across an entire planning area).

- **Output:** A product created by the oil and gas proponent that documents actions (both proposed and completed) and reports on plans and progress towards achieving specified targets.

Targets

The sustainable management framework identifies primary "criteria", and key "elements" or components of those criteria, that are critical to achieving sustainable management of the resource values and uses, in relation to oil and gas activities. In moving from strategic to operational levels, the framework further describes objectives, indicators and the measurable targets that must be achieved.

Figure 3-2 illustrates the components of the results-based management framework as it is applied from the strategic to operational levels.

- **Criterion:** A fundamental standard against which a sustainable management framework can be assessed. In the context of pre-tenure planning, a criterion represents a strategic resource value of the M-KMA.
- **Element:** A key constituent of the criterion. Elements represent major features of the criterion with which they are associated; they define the scope of a given criterion.

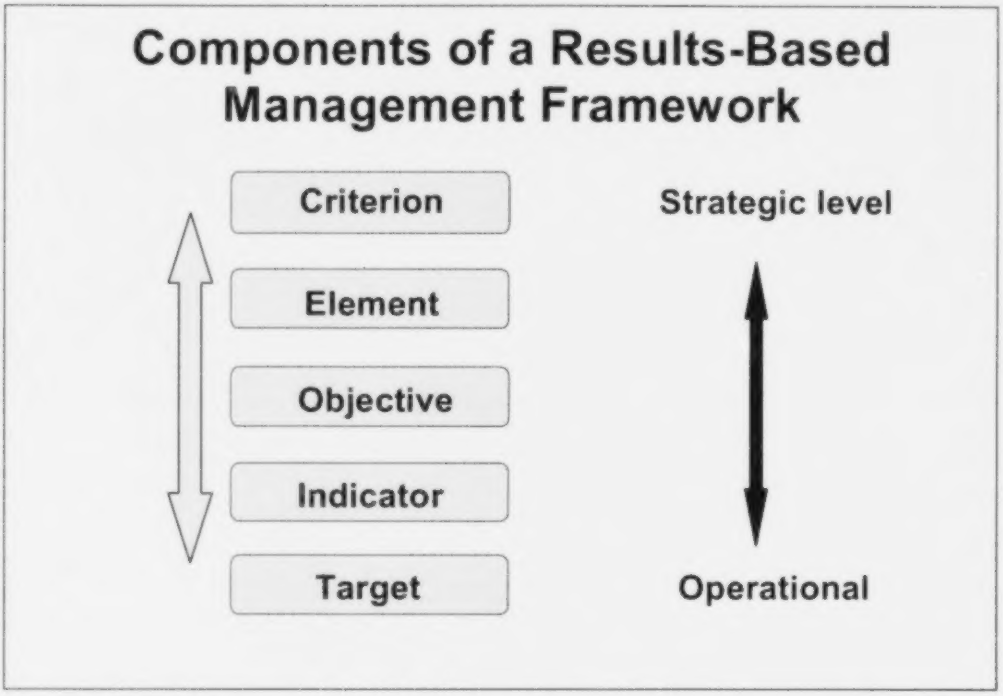
Components of a Results-Based Management Framework
Criterion
Element
Objective
Indicator
Target
Strategic level
Operational

Figure 3-2: Components of a results-based management framework

Each of these criteria and elements are then described in greater detail under the headings of:

- **Objective:** A broad statement describing an ideal future state or condition for a value.
- **Indicator:** A variable that measures or describes the state or condition of a value. Indicators identify local-level, measurable factors to assess the state of the resource values and the effectiveness of management practices. Indicators enable measurement of progress towards achieving an objective over time. An indicator is selected to represent a larger set of conditions or values.
- **Target:** A specific statement describing a desired future state or condition of an indicator. Targets are intended to be clearly defined, time-limited and quantifiable.

  In the context of pre-tenure planning, the target represents the socially acceptable, economically feasible, and environmentally sustainable conditions within which the outcomes of management activities are required to occur.

Quantifying targets to address a certain range of social, economic and environmental conditions simultaneously is clearly a significant challenge. The science and information used to quantify targets is imprecise and subjective and as a result, the indicators and targets may need to be modified in the future[3] in order to achieve the purpose of a pre-tenure plan as described in Chapter 1. In a few cases, numerical targets have not yet been established. The monitoring and adaptive management framework built into this plan (Chapter 8) is essential to tracking the success of the targets in delivering pre-tenure plans. Where changes are shown to be needed, future versions of this pre-tenure plan or amendments to it will address those needs.

The sustainable management framework describes a result that is to be achieved by a proponent. In most cases, the proponent has flexibility in using professional judgment to determine how to best achieve the result. In some cases, a more prescriptive approach is taken that specifies the expected target more directly (e.g. a particular site must remain 100% undisturbed).

The Introduction to this document specifies that pre-tenure plans apply only to oil and gas activities and the management direction is not legally binding on other resource sectors. Consistent with this, the Outputs, Objectives, Targets in the following sections apply only to the oil and gas sector. The intent of this document is to ensure a reasonable opportunity exists to undertake oil and gas development activities consistent with the *M-KMA Act*. Disturbances to the natural environment resulting from other sectors activities may lead to an cumulative impact greater than is allowed in the Targets in this plan; this will be assessed in the evolving cumulative impact management framework (see Sustainability and Plan Effectiveness Monitoring in Chapter 8).

3.1 General Planning and Management Direction

Responsible planning and management of oil and gas activities are essential to implementing the sustainable management framework that forms the basis of pre-tenure plans in the M-KMA. The planning and management direction addresses six key objectives, each with specific implementation products or outputs for which an oil and gas proponent is responsible. These objectives and outputs are summarized in Table 3-1.

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[3] Tenures are subject to the plan management direction applicable on the date of sale of tenure (see "Plan Updates" section of the Preface). Most modifications to indicators and targets are expected to be incremental fine-tuning that do not dramatically change the business case for development; as such, it is hoped that all tenure holders will work to achieve new plan directions.

Table 3-1: General Planning and Management Objectives and Outputs

	Objectives	Outputs
1	Well-Planned Activities	Overview assessments Record of coordination of new access proposals Development plans, including site-specific impact assessments and restoration plans Access management plans
2	Consultation with First Nations	Record of consultations with First Nations
3	Consultation with Other Stakeholders	Record of consultation with other stakeholders in advance of activities Record of consultation to coordinate access and pipeline use
4	Worker Orientation regarding the M-KMA	Worker orientation record Worker orientation strategy
5	Monitoring and Reporting[4]	Performance and compliance monitoring record
6	Adaptive Management[5]	Documentation of adaptive management opportunities Documentation of adaptive management approaches

This section provides a brief introduction to each of the Objectives and Outputs shown in Table 3-1. Oil and gas proponents are expected to use professional judgement in determining the best measures to be taken or format used in delivering the required outputs. The outputs identified here link directly to the targets discussed in Section 3.2 of this Chapter.

Appendix B contains suggested guidelines on the contents of some of the outputs required here. The guidelines are not intended to be comprehensive, but focus on some specific actions that are particularly important for implementing the overall sustainable management system of the pre-tenure plan.

Many types of assessments are indicated as outputs in this section. These assessments may address vegetation, terrain, habitat, soils, water, visual quality, and recreation resource values, among others. For each type of assessment, the basic requirements are:

(1) a pre-disturbance summary (or base case)

(2) disturbance proposed (or development scenario; more than one scenario may need to be assessed in some cases)

(3) comparison of actual disturbance to proposed disturbance

(4) restoration planned

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[4] Refer to Chapter 8 for further information.

[5] Refer to Chapter 8 and Appendix D for further information.

(5) restoration achieved

(6) an operations monitoring record that quantifies the impact associated with the identified management activities

The proponent identifies the best development scenario as one in which the social, environmental and economic values are optimized (see Figure 3-1). Documentation and rationalization of the best scenario is an important aspect of adaptive management and continuous improvement. This information will also assist in the subsequent evaluation of activities at both an operational and a strategic level by other parties involved in overall monitoring of pre-tenure plans in the M-KMA (see Chapter 8).

The following sections identify the outputs for which the proponent is responsible in relation to each management objective identified in Table 3-1.

OBJECTIVE 1 WELL-PLANNED ACTIVITIES

In recognition that the M-KMA is a unique area with a variety of special values, and in recognition that the mountainous terrain presents specific challenges to resource development, it is critical that oil and gas activities proposed in the M-KMA be well planned in advance. Requiring activities to be well-planned from inception, through operation, to closure and restoration, will identify and avoid or minimize impacts on the environment and on other users.

Output 1.1. Overview Assessment and Preliminary Development Plan

An overview assessment and preliminary development plan (referred to as "overview assessment") is required to set the groundwork for more detailed planning. As an initial step, this ensures the proponent has sufficient information about resource values and uses in the project area to proceed to more detailed development planning. Conducting an overview assessment will identify the range of resource values and uses within the project area, First Nations interests of the area and any other management objectives specific to the area. It will also provide an opportunity to scope out the potential for impacts and how they will be addressed.

An overview assessment:

1. covers the entire proposed project area;
2. describes the biophysical setting, including biophysical zones and attributes (vegetation, wildlife, wildlife habitat, site, soils, tenure types, boundaries, etc.);
3. provides information on First Nations interests;
4. describes other land uses and users;
5. describes any specific direction from strategic land use plans affecting the area. Refer to the Fort Nelson and Fort St. John LRMPs at:
   Fort Nelson LRMP: http://srmwww.gov.bc.ca/rmd/lrmp/frtnelsn/index.htm
   Fort St. John LRMP: http://srmwww.gov.bc.ca/rmd/lrmp/ftstjohn/index.htm; and
6. describes the overall project proposal.

The overview assessment identifies the potential for impacts of oil and gas activities on these values and other tenure holders or users at a broad level.

Output 1.2 Coordination of New Access Proposals

A key element of pre-tenure plans is to enable oil and gas development that uses the minimum amount of new access route construction needed to undertake the activities. To achieve this, the access needs of other oil and gas tenure holders, as well as other resource developers, must be taken into account where opportunities for access coordination exist, including coordinating the location of pipelines with access routes. Oil and gas proponents are required to coordinate new access proposals to reduce the amount of new access created and the impacts of that access on other uses and values. Shared access can also create cost savings to any one developer.

As an output, a record of consultation with other industrial tenure holders in the area should be submitted as part of any access proposal. This record, confirming the foreseeable access needs of other tenure holders, includes:

1. a record of other industrial tenure holders contacted to determine future access plans or needs;
2. a record of opportunities and agreements for sharing access or for locating access in a manner that facilitates use by other developers; and
3. scenarios for shared access, or justification as to why shared access is not feasible.

Output 1.3 Development Plans, including Site-specific Impact Assessments and Restoration Plans

The Development Plan is the most important output to pre-tenure planning. A development plan covers all phases of the development proposal, identifies potential impacts of activities, and identifies measures to avoid or mitigate impacts. Site-specific assessments are expected to be undertaken in development planning (refer to Site-specific impact assessments). A restoration plan specifying actions for restoration of disturbances is also part of development planning (refer to Restoration Plans).

Development Plans should include a level of detail appropriate to the stage of the project. Initial development plans for small projects may be relatively simple. For ongoing projects of expanding scope, development plans are expected to be amended to reflect new information and new proposals, as the project evolves.

Development plans, based on the overview assessment:

1. describe the proposed development in terms of the overall extent of activities, their location and related infrastructure (magnitude, temporal and spatial nature of proposal and actual impacts);
2. address issues identified during pre-development consultations or access coordination discussions;
3. identify potential for impacts on biophysical and other values and on other tenure holders and land users present in the area (use detailed impact assessments where appropriate);

4. avoid, minimize or mitigate those impacts in accordance with the Targets required in this pre-tenure plan;
5. describe how disturbances will be restored and any residual impacts expected;
6. identify any innovative adaptive management approaches proposed;
7. identify alternative access options; and
8. identify options for infrastructure development(s).

Development plans should also include:

1. documentation of impact assessments undertaken (i.e., terrain and terrain stability, soils, archaeological, visual quality, vegetation, etc.) and their location;
2. evaluation of alternative access options;
3. documentation of a photographic record of sites where developments (access corridors, lease sites, etc.) will occur; and
4. documentation of any measures taken to avoid or mitigate impacts of activities on other resource values and uses, as identified through consultations with First Nations or stakeholders. Any unresolved issues will be identified.

Site-Specific Impact Assessments may be required to address site-specific issues associated with the surface disturbances of a development proposal in the project area. These assessments will provide information on resource values and uses to determine whether, where and how activities may be carried out at a specific location. Some locations will not be appropriate for oil and gas development activities; site-specific impact assessments should identify this and locate alternate locations.

Site-specific impact assessments provide field-based evaluations that reflect the levels of risk and impacts of activities such that the OGC can determine whether the activity is consistent with the pre-tenure plan (i.e., if the activity is acceptable at this site or if an alternate site should be chosen).

Site-specific impact assessments:

1. describe the base-case or predevelopment environmental condition for monitoring restoration and resource value indicators and targets;
2. document the impact assessments undertaken and their specific location;
3. are conducted where proposed activities will result in direct impacts to identified resource values through surface disturbance; and
4. include assessments of vegetation, fish and wildlife habitat, terrain stability, visual quality, auditory, air quality, water quality, archaeological, riparian values or existing recreational or traditional First Nation uses (among others) as appropriate to the values at that site.

A Restoration Plan addresses restoration needs associated with the surface disturbances of a development proposal in the project area. This plan reflects information on resource values and uses to determine where and how natural resource values are restored at a specific location. The natural, pre-development condition of identified values (i.e., vegetation) in the project area is a key value to be addressed in the restoration plan. The objective of restoration is to return lands to their natural state as much as possible.

Restoration plans provide field-based evaluations that:

1. reflect the pre-development condition of identified values in the project area;
2. identify progressive restoration of disturbances with short- and long-term objectives on lands no longer needed for ongoing development following each phase of a project; and
3. include a pre-development photographic record of sites to be disturbed.

Output 1.4 Access Management Plans

An Access Management Plan is needed for oil and gas development to avoid or mitigate adverse impacts to other resource values and users. Access planning and coordination can also contribute to economic savings where access infrastructure costs are shared.

Clear justification must be made by a proponent to justify the type of access and the timing of use required to support a specific development proposal. Each access proposal will be assessed by the OGC according to the particular situation and in the context of the requirements of this pre-tenure plan. This plan allows for seasonal or multi-season surface access for exploration or development, provided a clear justification is made and the outcomes of the access development are consistent with the Targets set in this plan. This plan also allows for the use of heliportable drilling technologies and similar justifications and outcome will be required.

An access management plan will:

1. identify measures to avoid or mitigate adverse impacts on other resource values and users, including the access control measures required under the M-K Access Management Area regulation[6] (http://www.qp.gov.bc.ca/statreg/reg/W/Wildlife/183_99.htm);
2. evaluate alternative access options;
3. justify the need for the type of access proposed and the timing of use;
4. describe the duration of the access need and restoration activities (link to restoration plans);
5. document avoidance and mitigation measures undertaken;
6. document consultations with First Nations, other stakeholders and other industrial tenure holders; and
7. document how environmental, social, and economic values have been addressed and identify how any unresolved conflicts are being addressed.

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[6] Additional information on designated access routes, including maps, is available on the M-KMA website at: http://srmwww.gov.bc.ca/rmd/lrmp/mk/mk0301/maps/access/routes.html

OBJECTIVE 2 CONSULTATION WITH FIRST NATIONS

Consultation with First Nations is a requirement of oil and gas proponents to determine First Nations interests in the area and to plan to avoid or mitigate impacts to First Nations' interests. A record of the consultations is to be submitted along with the development plan.

Output 2.1 Consultation with First Nations[7]

Proponents will hold pre-development meetings with potentially affected First Nations to inform them of development proposals and to receive information from First Nations. Consultation should fully inform First Nations about the proposed development and should facilitate First Nations input to describe aboriginal interests and possible impacts on those interests and to improve the project proposal through incorporation of First Nation expertise and traditional knowledge.

Proponents will consult with First Nations concerning aspects of the proposed project, including (but not limited to):

1. First Nation knowledge about and use of the project proposal area;
2. development plans;
3. access proposals and access control measures;
4. training and economic opportunities; and
5. potential impacts of proposed developments on aboriginal uses of the area.

Output 2.2 Report of First Nations Consultation Actions

A report on the First Nation consultation process is to be submitted to the OGC. This report will identify all consultations with First Nations, summarize issues identified and outline actions taken to address them. Any outstanding issues will be identified.

First Nations consultations are documented in a report that identifies issues and actions taken to address them. The outcome of economic opportunity discussions will also be described. The report of First Nations Consultation Actions will include:

1. a record of pre-development meetings;
2. a record of information sharing opportunities;
3. documentation of First Nations' expertise incorporated in development plans;
4. documentation of outcomes of economic opportunity discussions; and
5. documentation of unresolved concerns and efforts proposed to address them.

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[7] Consultation requirements may evolve over time, consistent with law and policy.

OBJECTIVE 3 CONSULTATION WITH OTHER USERS AND STAKEHOLDERS

Consultation with other tenure holders and users with a direct interest[8] in the pre-tenure plan area is a requirement of proponents to exchange information on areas used and timing of activities. Consultations should identify potential impacts and options to avoid or mitigate those impacts. Consultations should ensure access needs are coordinated consistent with the M-K Access Management Area regulation. Reports on consultation actions are to be submitted to the OGC.

Output 3.1 Consultation with Other Users and Stakeholders

Pre-development consultation with affected users and stakeholders is required to exchange information and avoid or mitigate potentially conflicting uses. This creates opportunities to inform and receive input from other users and stakeholders in the project area, prior to development plans being completed. Information exchange will lead to improved development planning. Other "users and stakeholders" includes all tenure holders plus those groups with a direct interest in the pre-tenure plan area.

A consultation record includes:

1. pre-development meetings;
2. information sharing opportunities;
3. documentation of interests, values, uses; and
4. documentation of issues identified, unresolved concerns and efforts to address them.

Output 3.2 Consultation to Coordinate Access and Pipeline Use

Proponents are required to consult with other industrial users to determine opportunities for coordinating access needs in a manner that reduces overall impacts. Proponents will also consult with other oil and gas developers to explore opportunities for sharing pipeline facilities.

Consultation to coordinate access and pipeline use will reduce environmental and social impacts due to fewer access and pipeline routes.

A consultation record includes:

1. pre-development meetings;
2. information sharing opportunities;
3. documentation of interests, values, uses;
4. documentation of issues identified, unresolved concerns and efforts to address them;
5. documentation of shared access management agreements;
6. documentation of shared infrastructure management agreements; and
7. documentation of rationale for multiple access or pipelines within one watershed.

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[8] Tenure holders clearly have a direct interest in the area and must be consulted with. However, it is more difficult to identify which non-tenured interest groups need to be consulted. The concept of a registry, maintained by the OGC, to identify such non-tenured groups was discussed in PTP workshops. Non-tenured groups may notify the OGC to establish their "direct interests" in a PTP area.

OBJECTIVE 4 WORKER ORIENTATION

Workers who fully understand the origins and reason for the M-KMA and pre-tenure plans will be much better informed in carrying out their daily tasks in a manner that achieves the required Targets of this plan. An orientation on the M-KMA is to be provided to all employees and contractors working in the project area. This will include notification to workers that recreational use of the area is prohibited while accessing the area for industrial purposes.

Output 4.1 Orientation

Orientation outputs include:

1. worker orientation strategy developed and implemented; and
2. documentation of worker orientation undertaken.

OBJECTIVE 5 MONITORING AND REPORTING

Monitoring and reporting are key aspects of the overall management system for pre-tenure plan areas. Oil and gas proponents will be required to monitor and report on their activities to document compliance with OGC permit conditions, which must be consistent with this pre-tenure plan.

Oil and gas proponents will monitor and report on their access and development activities as required to meet specific Targets in Section 3.2. Monitoring will enable verification of compliance, minimize unforeseen outcomes and provide the means for documenting innovative or adaptive management practices. Documentation of successful adaptive management approaches will facilitate their use elsewhere (refer to Objective 6, Adaptive Management). Monitoring of specific indicators will also be used by MSRM and others as described in Chapter 8.

Output 5.1 Monitoring and Reporting

Activities are monitored on an ongoing basis to ensure plan targets are achieved, to discover unforeseen events early and minimize impacts and to document innovative or adaptive management approaches.

Qualified environmental monitor(s) will oversee activities that disturb the ground surface and perform assessments of all disturbed areas to ensure targets required in this pre-tenure plan are being met. Monitoring reports will be submitted to the OGC.

A monitoring record documents:

1. compliance with Targets required in the pre-tenure plan;
2. any unforeseen events leading to non-compliance with Targets; a description of the unforeseen impacts and how they have been mitigated or restored;
3. adaptive management approaches used, including documentation of the success or failure of the approach from a social, environmental and economic perspective; and
4. compliance with OGC permit conditions including the Development Plan.

OBJECTIVE 6 ADAPTIVE MANAGEMENT

The use of adaptive management provides opportunities for continually improving operational practices by learning from innovative approaches and outcomes. The overall goal is to optimize environmental, social and economic values. In some cases, innovation is tested in a "passive" trial and error approach using professional judgement about creative ways to address issues. However, a more formal or "active" approach to adaptive management will adopt a rigorous system to design and test innovative techniques, and to measure targets. The latter approach is encouraged as a means of potentially resolving differences of opinion on the location or type of acceptable activities. It is recognized that certain projects may not present opportunities to apply new/innovative adaptive management approaches. However, wherever possible, industry is encouraged to apply adaptive management techniques and contribute to continual improvement of operational practices in the M-KMA. Appendix D provides further information on adaptive management. Also refer to Chapter 8 on Monitoring and Adaptive Management.

Output 6.1 Adaptive Management

The initial adaptive management output consists of:

1. documentation of adaptive management opportunities.

Where adaptive management approaches are applied, additional output consists of:

1. documentation of adaptive management approaches, both active and passive, used to increase understanding of operating efficiencies (reducing environmental and social impacts while creating economic savings) and of impacts from development activities;
2. documentation of any adaptive management "experiments" (see Appendix D) that were developed to assist in resolving disputes between stakeholders;
3. reports outlining active adaptive management practices, and describing their degree of success or failure;
4. identification of participants involved in the innovative or adaptive approach;
5. monitoring reports (refer to Output 5.1) that describe passive innovative approaches and their degrees of success or failure; and
6. documentation of reduced impacts and economic savings.

3.2 Management Direction

The strategic level criteria and elements underlying the Management Direction portion of the sustainable management framework are summarized in Table 3-2. These form the basis for addressing the environmental, social and economic values in all pre-tenure plan areas across the M-KMA.

Table 3-2: Criteria and Elements for Management Direction

Criteria	Elements
1. Conservation of Biological Diversity	Conservation of ecosystem diversity Conservation of species diversity Areas of special biological significance Restoration of ecosystems
2. Conservation of Soil and Water Resources	Conservation of soil quantity and quality Conservation of water quantity and quality
3. Multiple Benefits to Society	Recognition of Treaty rights First Nations' economic opportunities Energy benefits Non-energy benefits Wilderness

The following tables in this section provide a brief introduction to each of the Criteria and Elements shown above. The focus is on identifying the key objectives of each element and clearly specifying the targets to be achieved by an oil and gas proponent. Indicators are identified to provide direction on how progress towards a target is to be measured.

Outputs are identified in order to show clear linkages to the General Planning and Management Direction outlined in Section 3.1.

Appendix C contains suggested guidelines as options to assist proponents in achieving the targets detailed in these tables. The guidelines are not intended to be comprehensive, but focus on some specific activities or sites that are particularly important for achieving the desired conditions and implementing the overall sustainable management framework of the pre-tenure plan.

Indicators and Targets

Indicators have been carefully selected to be representative of the strategic resource values present in the M-KMA in relation to oil and gas resource development. A complementary suite of a reasonable number of indicators has been chosen as the most practical approach for achieving intended pre-tenure plan outcomes. The choice of indicators has in part been assisted by the information in and expertise behind the draft "Cumulative Effects Thresholds and Case Studies" document prepared for the Cumulative Effects Assessment and Management Framework for Northeast British Columbia.[9]

Quantifying numerical targets for the Elements in Table 3-2 is recognized as one of the more challenging aspects of creating a pre-tenure plan. The targets applied in this plan attempt to optimize the various values characterized in Figure 3-1. In some instances, a numerical target has not yet been established; in these cases, proponents are asked to report on hectares of disturbance, measured by specific units, to enable a broader level of monitoring of the Element in question. This information may be used to quantify a target at a future date. In some instances what could have been considered an acceptable target for one Element was seen as leading to more impact than is allowed under the target set for another Element. Where this potentially conflicting direction was foreseen, the more limiting target has been repeated (for an example, see the target for Element 2.1, Conservation of Soil Resources). This reduces the confusion of conflicting direction under different Elements and it reduces the number of indicators and targets that must be monitored.

The targets and indicators represent a work-in-progress. Monitoring of activities will be critical in determining whether the numerical values currently set for the targets will lead to effective implementation of the pre-tenure plans; adaptive management is also an important component of effective implementation. Existing targets or indicators may be revised in future versions of the pre-tenure plan or through plan amendments as identified in Chapter 9. Variances to targets may be sought on a project-by-project basis, as discussed in Chapter 9.

Achieving the Targets

In many cases the targets require oil and gas proponents to track and report on the number of hectares of physical disturbance, or hectares restored, both proposed in development planning and actually done in the field. In addition, some of the indicators directly address biological and ecosystem values, which may be based on information found in the predictive ecosystem mapping conducted for pre-tenure planning.

To achieve the targets, it is fully expected that oil and gas proponents will require qualified biological expertise, working together with geographic information system operators. Sources for the digital data required to calculate numerical values for targets are provided where needed. Importing this data and combining it with maps of development plans will allow for GIS calculation of numerical measures for proposed and actual physical disturbances.

Further guidance on "*achieving the target*" is provided for some of the targets identified in the following pages. This document strives to explain the rationale and approach for achieving the targets to the layperson, but it is expected that appropriate biological expertise will be employed to properly meet the management directions in this Chapter.

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[9] A January 2003 draft of this report, prepared by Salmo Consulting Inc., Calgary, and Diversified Environmental Services, Fort St. John, was provided to the Pre-Tenure Planning Working Group. One of the principals involved provided the Working Group with advice on selecting indicators in an Indicators Workshop held in March 2003.

CRITERION 1 CONSERVATION OF BIOLOGICAL DIVERSITY

Realizing this criterion will conserve biological diversity, ecosystem condition and productivity by maintaining integrity, function and diversity of living organisms and their associated complexes. Each oil and gas proponent has a contributing role in conserving biological diversity and this role may be more or less critical depending on the rarity or sensitivity of the specific values in the area of operations. Each proponent is responsible for achieving the specified targets for the project area. All proponent output will be monitored by the provincial government to ensure biological diversity is being conserved at the landscape level (see Chapter 8 for monitoring responsibilities).

Predictive Ecosystem Mapping (PEM) has been completed for the pre-tenure plan areas shown on Figure 1. To assess indicators within this criterion, the PEM data provides the fundamental ecological units for analysis. PEM polygons are based on several ecological attributes including site series, structural stage, soil moisture and nutrient regimes, slope, and aspect. Direction on using and finding PEM digital information is available at: http://srmwww.gov.bc.ca/rmd/ccdev/mog/ptp/gisdatasets.htm.

Element 1.1 Conservation of Ecosystem Diversity

This element addresses the conservation of ecosystem diversity at a variety of scales, from site through to landscape level. The proponent is responsible for conservation of ecosystem diversity for their project area(s) within their tenure area (including access routes within and outside tenures). At the landscape level, the provincial government will monitor anticipated and actual proponent impacts.

Ecosystems are dynamic and their natural distribution reflects their structure and function. Management of oil and gas activities is expected to sustain the natural distribution and collective structure and function of ecosystems as represented through the PEM polygons.

Objective	Indicator	Target	Output
The structure and function, and distribution of ecosystems remain within a natural range	Disturbance (ha's) to site series and associated structural stage within the project area(s).	Site series remains intact after development and restoration. (measured as hectares of disturbance: see "Achieving the Target")	Overview assessment Restoration plan Operations monitoring record, including indicators monitoring

Achieving the Target:

Presently, no numeric target(s) exist for this element due to the lack of baseline information regarding the extent of short- and long-term impacts that ecosystems can sustain before their structure and function is adversely impacted. To enable assessment of this indicator and target, proponents are required to track the amount of physical disturbance to site series and structural stage as provided in the PEM digital layers. This information is available in both spatial and non-spatial formats. A proponent can overlay their development plan on the existing PEM spatial digital layer to assess the PEM polygons and associated site series and structural stages that are potentially impacted. Hectares of disturbance to site series and structural stages can then be readily calculated.

Element 1.2 Conservation of Species Diversity

Within the oil and gas project area, the conservation of habitat and wildlife species diversity must be addressed by each proponent. Overview assessments will identify the likelihood of adversely impacting wildlife habitat, including the habitat of red or blue listed species (Appendix E). Where there is potential for impacts, more detailed assessments and conservation measures are to be applied. At the landscape level, the provincial government will monitor anticipated and actual proponent impacts to compare against the indicators and targets for conserving species diversity (see Chapter 8).

A key value layer used is individual winter habitat capability for five focal species: elk, Stone's sheep, mountain goat, moose and plains bison. The winter season was selected to rank habitat capability because the availability of high capability winter habitat is one of the main limiting factors on ungulate survival.

These five focal species were used because recent vegetation mapping within the M-KMA is at an adequate scale to identify key habitat components used in habitat capability modelling. Furthermore, these species are harvested in various areas of the province and are species of "management concern" and as a result habitat information and knowledge are available and were referenced when developing the habitat models.

Winter habitat capability for each focal species provides the basis for biophysical zone delineation. For example, Stone's sheep and mountain goat high capability winter habitat is predominantly within the *Steep Slope-Warm Aspect Biophysical Zone*. Conversely, elk, moose and plains bison high capability winter habitat is predominantly within the *Warm Aspect Forest* and *Low Elevation Biophysical Zones*.

For each focal species, the provincial 6 class habitat rating system[10] was used, as follows:

Class	Rank
1	High
2	Moderately High
3	Moderate
4	Low
5	Very Low
6	Nil

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[10] Focal species habitat capability was ranked relative to the provincial benchmark for that species. The provincial benchmark is the highest capability habitat against which all other habitats for that species are rated.

For each focal species, there are different winter habitat requirements. Therefore, winter habitat capability for the five focal species was not summarized into a single digital data layer.

The targets selected measure the hectares of direct ground disturbance in various habitat classes. The selection of these targets recognizes that this direct impact has a larger impact on habitat effectiveness across an adjacent "zone of influence" and that the use of adjacent habitat by wildlife is impacted by the frequency and season of oil and gas activity. These targets also recognize that the habitat on steeper terrain is critical winter habitat for Stone's sheep and goats and is therefore extremely sensitive to disturbance with respect to conservation of species diversity. Similarly, the targets recognize that in lower elevations as represented in habitat used by elk, moose or bison, that sufficient flexibility is required to enable oil and gas activities, particularly access.

Geophysical activities are guided by a separate stand-alone document being created by the Oil and Gas Commission and are not subject to the management direction in this plan, however new habitat disturbance created by new geophysical activities will be included in the monitoring of plan area targets conducted by the Ministry of Sustainable Resource Management. Therefore new geophysical disturbances will be accounted for in achieving the targets for species conservation; the targets have been set with this in mind (see Chapter 8 for more details on monitoring). The targets also introduce the concept of a cautionary threshold that seeks cooperation in limiting long-term impacts; this is explained further under "Achieving the Target."

Objective	Indicator	Target	Output
Habitat elements for each focal species are sustained in winter habitat capability classes that range from 1-6 within each biophysical zone.	For each focal species, the amount (% and ha) of disturbance by habitat capability class.	For the plains bison, moose and elk focal species, 97% of the winter habitat remains undisturbed in moderately high and high capability habitat. For the Stone's sheep and mountain goat focal species, 98% of the winter habitat remains undisturbed in moderately high to high capability habitat. For each focal species, 95 % of winter habitat remains undisturbed in very low to nil capability habitat.	Overview assessment Site-level habitat assessment Operations monitoring record, including indicators monitoring Restoration plan

Achieving the Target:

The indicator and target for this element can be assessed by overlaying the development plan on the habitat capability digital layer for each focal species. Disturbances must remain below the specified target for each of the focal species therefore impacts to each species must be assessed.

Disturbances are time limited and once they are restored, those hectares of disturbance no longer contribute to the target. As an example, a winter access made from materials that are laid down on top of vegetation and soils may constitute disturbance while it is in place, but once the construction materials are removed and vegetation springs back, the disturbance no longer exists. Restoration is required to return a site to a self-sustaining vegetative state that will provide habitat capability equivalent to or better than pre-disturbance conditions. The OGC will make final decisions on when restoration reaches this state, so that disturbances are no longer accounted for in the Target monitoring. For more detail on restoration, see Element 1.4, Restoration of ecosystems.

The targets are set to account for new geophysical disturbances and to foresee activities required to support significant new discoveries. MSRM will monitor hectares of disturbance across a plan area in accordance with the above targets. When hectares of disturbance reach certain thresholds in a plan area, all oil and gas operators in that plan area will be asked to review existing disturbances with a view to proactively restoring any disturbed areas that are no longer needed for ongoing or future development activities. This review will be sought when MSRM's monitoring demonstrates that:

- disturbance in the plan area has reached 1% of high and moderately high winter habitat for mountain goats and/or Stone's sheep, or
- disturbance in the plan area has reached 2% of high and moderately high winter habitat for elk, moose and/or plains bison.

The intent is to work with oil and gas operators to collaborate on reducing overall disturbances but it is not intended to lead to premature restoration of areas needed for future activities.

The numerical targets of 98%, 97% or 95% undisturbed, allow for 2%, 3% or 5% respectively for areas available for oil and gas activities. The pre-tenure plan still provides considerable flexibility in "where activities can occur" by not specifying areas where the 2%, 3% or 5% is to be allocated. While at first glance this may appear to be extremely limiting for oil and gas activities, the following tables illustrate the approximate number of hectares that is potentially[11] available for oil and gas activities for each focal species by habitat class for the Halfway-Graham and Muskwa-West (southern portion) areas.

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[11] Proponents are expected to minimize adverse impacts to wildlife habitat during oil and gas activities. Furthermore, available hectares for disturbance may be further constrained due to other factors in this pre-tenure plan, including targets set for non-habitat values.

Hectares Available for Oil/Gas Activities
Halfway-Graham Pre-Tenure Plan Area
(total: 234,902 hectares)

Focal Species	Habitat Classes 1 & 2	Habitat Classes 3-6
Plains bison	1131	9829
Moose	1266	9601
Stone's sheep	604	10204
Elk	1284	9570
Mountain goat	104	11450

Hectares Available for Oil/Gas Activities
Southern Portion of the Muskwa West Pre-Tenure Plan Area
(total: 97,657 hectares)

Focal Species	Habitat Classes 1 & 2	Habitat Classes 3-6
Moose	1887	1720
Stone's sheep	8	4849
Elk	996	3206
Mountain goat	0.8	4866

The above tables demonstrate that the plan provides ample "room" to carry out oil and gas exploration and production activities within the 2% or 3% of lands in high or moderately high habitat capability classes for key focal species. The lower elevation lands (found largely in the moose, elk or bison habitat) provide the greatest opportunity and flexibility to locate oil and gas activities, consistent with the greater need for access routes in lower elevation areas. The higher elevation lands (found largely in the Stone's sheep and goat habitat) offer less of an opportunity, consistent with the importance of the steep terrain as critical winter habitat and the fact that the very steep terrain precludes development in many areas. The very limited opportunity in steep terrain (Stone's sheep and goat habitat) of the southern portion of Muskwa-West area primarily reflects the very limited extent of this terrain in the pre-tenure plan area.

Element 1.3 Areas of Special Biological Significance

Areas of special biological significance include wildlife features such as dens, licks and wallows; resource features such as natural heritage sites; and wildlife habitat areas (WHA's). Areas or features of special biological significance encountered within a project area must be identified and managed for their long-term maintenance.

At a strategic level, within the M-KMA, areas of special biological significance are also reflected in existing strategic land use decisions or under specific legislation (i.e., Parks and Special Management Zones approved through the Ft. Nelson and Fort St. John LRMPs and the M-K Access Management Area (*Wildlife Act*)) where management direction already exists. This direction has been incorporated into pre-tenure plans. For further information:

- maps can be found by following http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm; and,
- documents can be found at http://srmwww.gov.bc.ca/rmd/lrmp/index.htm)

Objective	Indicator	Target	Output
Areas of special biological significance are conserved physically and functionally.	Number of wildlife and resource features physically and functionally disturbed.	100% of identified site specific features remain physically undisturbed. Activities conducted within Wildlife Habitat Areas are consistent with the requirements of the WHA and the Identified Wildlife Management Strategy.[12]	Overview assessment Site-level habitat assessment Operations monitoring record, including indicators monitoring Restoration plan

Achieving the Target:

The wildlife and resource features identified above require protection but are not spatially identified within the pre-tenure plan areas. These features will be located and identified at the assessment stage, particularly during site specific assessments. These features are typically localized and occupy relatively small areas. Therefore, no difficulties are anticipated in achieving the "no physical disturbance" target. However, the separation between the feature and the location of disturbances, and the timing and frequency oil and gas activities, must all be considered to ensure wildlife use of these features are not adversely impacted.

Oil and gas activities are generally permitted in Wildlife Habitat Areas (WHAs), but may be restricted at certain sites within the WHA or at certain times. These restrictions are identified in the "general wildlife measures" for the particular WHA. The OGC is the approving authority for oil and gas activities in WHAs. Variances to the general wildlife measures may be sought to accommodate site-specific conditions and activities. Where WHAs occur they will be described in greater detail in the Chapters of this document specific to that pre-tenure plan area. Should new WHA proposals be made in the future, they will be referred to any existing tenure holder(s) for comment.

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[12] Information on the IWMS can be found at: http://wlapwww.gov.bc.ca/wld/identified/strategy_info.htm. The IWMS primarily focuses on timber issues and the forest sector, however it does have provisions to address oil and gas industry activities and concerns (see: http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/other/wild/index.htm.)

Element 1.4 Ecosystem Restoration

Each proponent can make direct contributions to achieving ecosystem restoration within their respective project area(s). While it is recognized that 100% restoration of resource values and uses to the pre-disturbance state is not always possible, the long-term intent is to return all disturbances to their natural state as much as possible, as development activities are completed. Restoration activities by an oil and gas proponent should pro-actively address the majority of the targets set here in the short term, however it is recognized that fully achieving the target may require a long-term approach to fully allow natural vegetation to complete the restoration intent. It is expected that early restoration activities will be initiated on any disturbed lands no longer needed for ongoing development.

Restoration requires returning ecosystems to their natural vegetative state as much as possible over time. Once native vegetation has been restored to a self-sustaining cover that will provide equivalent or better wildlife habitat capability over the areas specified in the targets, the restoration requirements have been met. The final decision on when restoration responsibilities are complete rests with the OGC.

Objective	Indicator	Target	Output
Ecosystems disturbed by development are restored to simulate natural pre-development conditions.	Abundance (% cover) and distribution of non-native species.	No increase in abundance and no change in distribution of non-native species over the long-term (short-lived non-native species are permissible to stabilize soils and facilitate native species growth).	Overview assessment Site-level assessments: ▸ Hydrology ▸ Geomorphology ▸ Soil ▸ Habitat Restoration plan Operations monitoring record, including indicators monitoring
	Proportion and amount (% and ha) of disturbed area restored.	Over time, 99% of the disturbed area is restored to simulate pre-development conditions in high and moderately high capability habitat (Classes 1 and 2) for each focal species (see Element 1.2). Over time, 95% of the disturbed area is restored to simulate pre-development conditions in moderate to nil capability habitat (Classes 3 to 6) for each focal species.	

Achieving the Target:

Ecosystem restoration implies that aquatic and terrestrial ecosystems (e.g., attributes such as vegetation structure, abundance, distribution; soil moisture and nutrient regimes; drainage patterns; landforms, and local geomorphology that reflect ecosystem structure, function, and distribution) are restored to their natural state as much as possible over time. This applies to the project area for an individual proponent. Restoration activities may use non-native species that are short-lived such as fall rye to stabilize areas quickly, thereby facilitating growth of native species in the short term. Preventing the spread of noxious weeds is critical.

Disturbed lands must be stabilized or restored when they are no longer needed for ongoing development activities. It is recognized that there may be a temporary hiatus in development activities and disturbed areas may be needed again in the future. Where this future need is identified in development plans and it is less than five years into the future, actions must be taken to stabilize disturbed areas to prevent erosion while planning for their future use. Where the future need is not specified or it is longer than five years away, land disturbances should be restored consistent with the above directions.

CRITERION 2 CONSERVATION OF SOIL AND WATER RESOURCES

Conserving soil and water resources in the project area is a direct responsibility of all oil and gas operators as this criterion can largely be managed at the site or operational level. Monitoring and reporting is required from oil and gas operators, and strategic monitoring and reporting of activities and impacts will be done by others involved in the management framework (see Chapter 8).

Element 2.1 Conservation of Soil Resources

Conserving soil resources by maintaining soil structure and function is key to sustaining soil productivity and the vegetation it supports. Different biophysical zones have different sensitivities to soil disturbance, with some zones having characteristics that are particularly susceptible to disturbance. Introduction of deleterious materials or contaminants can negatively impact soil productivity. Site-specific assessments and restoration programs are the main tools in managing for this element.

Based on a bio-terrain classification as reflected in PEM[13], the following three summarized risk classes reflect soil sensitivity to disturbance.

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[13] Directions on locating PEM data can be found at: http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm

Risk Class	Description
High	Predominantly occurring on upper slope positions and high elevation plateaus, steep slopes>45%, sensitive soils (e.g., permafrost soils, high elevation soils, saturated soils, organic soils)
Moderate	Predominantly occurring on low to mid-position slopes 30-45% on morainal surficial materials; slopes <20% lacustrine surficial materials
Low	Predominantly occurring on valley bottoms, slopes <30% on morainal surficial materials, slopes <10% on lacustrine surficial materials

For the purpose of this pre-tenure plan, the high, moderate and low risk classes provide the basis for assessing disturbance to soil resources. Additionally, soil quality will be assessed by reporting the introduction of deleterious substances to soils.

Objective	Indicator	Target	Output
Soil resources are able to sustain productive ecosystems.	Disturbance to habitat capability (used here as a surrogate for area disturbed (% and ha) by risk class) (see further explanation for overlapping indicators at the start of Section 3.2).	The amount of permitted disturbance cannot exceed targets specified in Element 1.2, Conservation of Species Diversity.	Overview assessment Site-level assessments: - Hydrology - Geomorphology - Soil - Vegetation
	Introduction of deleterious substances into soils.	Zero spills / seeps of deleterious substances entering soils.	Restoration plans Operations monitoring record

Achieving the Target:

There is considerable overlap between the risk classes for soil sensitivity and the winter habitat capability classes for the focal species discussed in Element 1.2; the key linking factor is slope. The high risk class above largely coincides with the steep terrain that is critically important for focal species. As a result, the targets applied here are those used for Element 1.2, Conservation of Species Diversity.

Element 2.2 Conservation of Water Resources

Conserving water resources by maintaining water quality and quantity is key to sustaining hydrologic values. Hydrological characteristics are influenced by and reflect differences in elevation and physiography across biophysical zones. For example, the complexity of riparian systems is substantially greater in the river biophysical zone versus the high elevation plateau biophysical zone. Site-specific assessments, actions to prevent impacts, and restoration programs are the main tools in managing for this element.

Objective	Indicator	Target	Output
Maintenance of water quality and quantity within the natural range of variation.	Introduction of deleterious substances into waterbodies.	Zero spills / seeps of deleterious substances (human-made fluids or solids) entering waterbodies.	Overview assessment Site-level assessments: - Hydrology - Geomorphology - Soil - Vegetation
	Changes in natural drainage patterns and flow rates.	Turbidity downstream from activities remains within the normal range. Maintain natural drainage patterns and quantity of flow.	Operations monitoring record Restoration plan

Achieving the Target:

Where activities traverse streams or watercourses, water quality downstream of oil and gas activities and/or structures must be the same as above. This measurement is typically done with a portable in-stream turbidity meter. Depending on season(s) and duration of use, the type of crossing structure must be of adequate size to withstand a flood level of a certain time interval (refer to the provincial Fish-Stream Crossing Guidebook[14]). It is recognized that other industrial users may use oil and gas access corridors and crossing structures and these activities should be conducted in a manner which does not result in the introduction of deleterious substances into any watercourses.

To the extent practicable, natural drainage patterns must be maintained; this is particularly important where the watercourse is active. Watercourse crossing structures should be located to avoid re-directing waterflow from one location to another. Where this is not possible, original drainage patterns should be re-established as part of restoration activities as soon as possible.

CRITERION 3 MULTIPLE BENEFITS TO SOCIETY

This criterion realizes multiple benefits to society from oil and gas activities while optimizing social, economic and environmental values. Oil and gas proponents need to recognize in the early stages of planning that both tenured and non-tenured resource interests currently exist in the M-KMA.

Oil and gas development provides both direct and indirect economic benefits through employment and revenue generation. Oil and gas developments must recognize Treaty rights and may offer new economic opportunities for First Nations in the M-KMA.

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[14] http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf

Element 3.1 Recognition of Treaty Rights and Consideration of Traditional Knowledge

First Nations have specific Treaty rights that must be addressed in oil and gas developments. Oil and gas proponents are required to discuss First Nations' interests in lands and resources as part of First Nations' consultation. The intent is to incorporate this information into development planning and activities.

Objective	Indicator	Target	Output
Recognition of Treaty rights and consideration of First Nations' traditional knowledge.	Known traditional resource uses (including hunting, fishing and trapping) and heritage sites.	Incorporation of First Nations' and aboriginal knowledge in all phases of planning and associated activities.	Consultation record Documentation of how First Nations' and aboriginal information has been incorporated into each phase of planning and associated activities and opportunities taken up by First Nations.

Element 3.2 First Nations' Economic Opportunities

As part of consultation, economic opportunities for First Nations including training and employment in a variety of occupations must be explored. It is expected that a variety of project and employment issues will need to be considered, such as competitiveness, capacity and worker safety. Whether this leads to satisfactory arrangements is entirely between the First Nation and the oil and gas proponent. The intent of this section is only to ensure these issues are explored and discussed.

Objective	Indicator	Target	Output
Opportunities for employment and other economic benefits are explored with First Nations.	Meetings with First Nations.	Ongoing information exchange with First Nations, and the proponent regarding economic opportunities	Consultation record Documentation of First Nations' economic opportunities (training, employment)
	Discussions with First Nations regarding training opportunities in a variety of occupations.	Seasonal and/or ongoing training opportunities for First Nations in a variety of occupations.	
	Discussions with First Nations regarding employment opportunities in a variety of occupations.	Seasonal and/or ongoing employment opportunities for First Nations in a variety of occupations.	

Element 3.3 Energy Benefits

Energy resources in the M-KMA are a Crown resource to be managed in a manner that balances economic, social and environmental values. Energy resource conservation practices will optimize benefits derived from energy development and recovery.

Objective	Indicator	Target	Output
Effective extraction of provincial oil and gas resources	Volume of oil and gas produced from each well Royalty generated from project	Energy resources developed in a manner consistent with OGC requirements for oil and gas resource conservation	Production data reported to OGC

Provincial revenue from oil and gas development in the M-KMA is another indicator of the overall effectiveness of pre-tenure plan implementation, insofar as it reflects that the plan is effective in attracting industry to purchase tenure and in facilitating responsible exploration and production activities. Pre-tenure plans are not intended to set objectives or targets for oil and gas operators on this topic as it is a government responsibility to monitor and report on provincial revenues. Chapter 8 identifies that MSRM, in cooperation with the OGC and MEM, will monitor and report on provincial revenue generated by oil and gas operations in the M-KMA as part of pre-tenure plan effectiveness monitoring.

Element 3.4 Non-Energy Benefits

Oil and gas proponents need to recognize in the early stages of planning that both tenured and non-tenured resource interests currently exist in the M-KMA. A number of commercial and recreational activities in the M-KMA provide economic benefits locally and provincially; some of these have significant growth potential. Objective 3 in Section 3.1 of this Chapter requires oil and gas proponents to consult with other users and stakeholders. Actions must be taken to minimize impacts of oil and gas activities on other sectors through avoidance or mitigation measures, including the coordination of access development and use across the pre-tenure plan area. Unresolved conflicts involving other users must be documented in sufficient detail to clearly identify the nature of the conflict including the location; type, timing and magnitude of disturbance; direct versus indirect disturbance; and the efforts made to address the conflict.

Objective	Indicator	Target	Output
Minimizing impacts of oil and gas activities on non-energy sectors with direct interests[15] in the planning area through avoidance or mitigation measures.	Number and nature of unresolved conflicts referred to the OGC for resolution.	Unresolved issues submitted to the OGC are minimized as much as possible. All unresolved issues are fully documented.	Overview Assessment Consultation records Documentation of issues and measures implemented to resolve
	Access development and use that is coordinated with other users.[16]	Coordinated development and use of access, where opportunities exist.	Access management plan (in a Development Plan). Operations monitoring record

Element 3.5 Wilderness

Management direction for this element is to maintain wilderness quality across the M-KMA over time. Wilderness quality comprises different things to different people and what constitutes acceptable impacts to wilderness over time is often highly subjective. Maintaining wilderness quality is much broader than individual oil and gas proponents can achieve in their project area, however there are actions that a proponent can undertake to contribute to this overall direction.

Some aspects of wilderness quality have been addressed in previously established management objectives and targets. These mainly emphasize the biological aspects of wilderness quality. Surrogates for measuring wilderness quality not already addressed include the setting of the natural environment (naturalness, distance from human-created facilities, chance of interaction with other people, etc.; to some degree, the Recreation Opportunity Spectrum (ROS)[17] classifications attempt to capture this), visual quality objectives (VQOs), and the guides for noise limitations.

The Ft. Nelson and Ft. St. John LRMPs identify maintaining a component of the land-base in primitive and semi-primitive ROS categories as LRMP objectives for pre-tenure plan areas. The overall intent is to maintain opportunities for wilderness recreation experiences, recognizing that the location of components or experiences may change over time. ROS categories also refer to "natural or natural appearing environments" which links closely to pre-tenure plan requirements for restoration of disturbances. Individual proponents cannot be held responsible for maintaining certain ROS categories when there may be other operators nearby. As a result, MSRM will monitor the component or extent of the pre-tenure plan areas maintained in primitive and semi-primitive ROS categories. Oil and gas proponents will be required to provide details on activities that can be used in this monitoring.

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[15] Tenure holders clearly have a direct interest in the area and must be consulted with. However, it is more difficult to identify which non-tenured interest groups need to be consulted. The concept of a registry, maintained by the OGC, to identify such non-tenured groups was discussed in PTP workshops. Non-tenured groups may notify the OGC to establish their "direct interests" in a PTP area. (see also Section 3.1, Objective 3 "*Consultation With Other Users And Stakeholders*")

[16] Access into the M-KMA by "other users" is restricted by the M-KMA Access Management Area Regulation. Non-industrial motorized access is limited to designated access routes as per the Regulation.

[17] Recreation Opportunity Spectrum is a methodology developed and used by Ministry of Forests that classifies and manages lands for recreation opportunities based on the remoteness, size, and evidence of humans. See Appendix F for more details.

Visual quality objectives will typically reflect the existence of visually sensitive areas and scenic areas. The LRMPs recommend the management of scenic areas (including travel and recreation corridors as identified by the Ministry of Forests visual landscape inventory), and visually sensitive areas along existing access corridors/trails and adjacent to Protected Areas. Impacts to visual quality might include artificial light, man-made linear features, well sites and production facilities. Proponents are expected to manage for visual quality within and adjacent to the project area. (the Ministry of Forests' recreation inventory includes information on visual landscape inventory approaches: website: http://142.36.245.168/webrec/index.html[18])

The Alberta Energy Utilities Board (EUB) Guide to Noise (*Noise Control Directive User Guide 38, November 1999; Alberta Energy Utilities Board*) recommends that new facilities for remote areas should be designed to meet a target sound level of 40 decibels (dBA) Leq[19] at a distance of 1.5 km. A target for noise management in this pre-tenure plan is based on this information. Refer to: http://www.eub.gov.ab.ca/BBS/requirements/Guides/g38.htm

Objective	Indicator	Target	Output
Maintain wilderness quality over time.	Location and amount of area disturbed.	Proponents are required to submit: - a digital map showing the location of activities, - the total number of hectares disturbed by activities, and - the total number of kilometers of linear disturbance.	Overview Assessments Visual impact assessment Access management plan Noise impact assessment (As per EUB Guide 38)
	Area disturbed (% and ha) in Visual Sensitivity Classes.	Visual Sensitivity Classes are not yet available. The information provided above will be used to monitor impacts.	Restoration Plans

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[18] The website is not designed to government standards so will be removed once an approved ARCIMS website is established (in progress). The data will soon be available through the corporate LAND AND RESOURCE DATA WAREHOUSE (LRDW). A different method of data exchange will be instituted with the LRDW. The web site is currently open to all public to freely download ROS, RFI and VLI data, by forest district, wherever they may be.

[19] Leq is a unit of measure used to represent an energy equivalent sound level. The Leq is the average A-weighted sound level over a specified period of time — a single-number representation of the cumulative acoustical energy measured over the interval.

Objective	Indicator	Target	Output
	Natural appearing environments.	Meeting the targets for Ecosystem Restoration, Element 1.4 will address this issue.	
	Noise levels at 1.5 km (or equivalent distance) from project area.	<40 dBA Leq at 1.5 km from project area (ambient + industrial noise).	

Achieving the Target:

While the targets identified above largely use surrogate measures for achieving the objective or for tracking impacts, oil and gas proponents can still undertake activities in a manner that contributes to achieving the objective. For example, linear disturbances and lease boundaries can be varied to visually resemble natural conditions where possible, thereby addressing the natural appearing environments and visual sensitivity indicators more directly.

4. HALFWAY-GRAHAM PRE-TENURE PLAN AREA

4.1 Plan Area Location

The Halfway-Graham pre-tenure plan area encompasses 234,906 hectares and is located at the southern end of the M-KMA (Figure 4-1). The plan area is bordered to the north by the Upper Sikanni pre-tenure plan area, and to the west by both the Upper Akie area and the Graham-Laurier Park. The eastern boundary of the pre-tenure plan area is a portion of the eastern boundary of the M-KMA.

4.1.1 Oil and Gas Tenure Disposition in the Plan Area

The Ministry of Energy and Mines is responsible for the disposition of all oil and gas tenures. A staged approach for tenure disposition is being used in the Halfway-Graham area to recognize important natural and First Nation interests and the steps being taken to gather additional information on these interests by the Halfway-River First Nation. Figure 4-1 illustrates this staged approach.

Once approved, this plan will apply to the entire Halfway-Graham pre-tenure planning area. Following approval, the Ministry of Energy and Mines will accept requests for tenure postings anywhere in the Halfway-Graham planning area. However, in 2003 the Ministry will only proceed with sales of tenures posted in the Halfway River valley as defined by the height of land surrounding the Halfway River drainage. Any tenure postings requested south of this area, that are located in any of the Cypress, Chowade or Graham River valleys, will be kept on file and the earliest that a tenure sale will occur is in January of 2004.

Therefore, the tenure posting and disposition process may begin in full for the Halfway River drainage area (i.e. the northern 1/3 of the planning area approximately) immediately following approval of this plan. In the remainder of the planning area, tenure postings may be requested following approval of this plan, however no tenure sales will be held until January 2004. All tenures sold will be subject to this pre-tenure plan, specifically including the requirements to consult with First Nations and to address First Nation interests in development planning and operations.

4.2 Biophysical and Resource Values

The topography of the Halfway Graham pre-tenure plan area is characterized by moderately rugged terrain with mountain ridges aligned in a general north-west/south-east orientation. Elevation ranges from 860 meters in the valley bottoms to 2600 meters in the northwest portion of the pre-tenure plan area. The Halfway, Chowade and Cypress River drainages are located in the central to northern portion of the pre-tenure plan area and flow to the east away from the foothills. The Graham River drains the southern portion of the pre-tenure plan area, flowing into the Peace River.

There are large continuous tracts of forest throughout the pre-tenure plan area, particularly within the wide valleys in the southern portion of the pre-tenure plan area.

Four biogeoclimatic (BEC) zones cover the pre-tenure plan area: Engelmann Spruce and Subalpine Fir (ESSF), the Spruce Willow Birch (SWB), Boreal White and Black Spruce (BWBS),) and Alpine Tundra (AT).

4.2.1 Biogeoclimatic Zones

Engelmann Spruce and Subalpine Fir - ESSF

The Halfway-Graham area is the only place in the M-KMA where the ESSF BEC zone occurs. It is the highest elevation forested zone, below the AT zone. This BEC zone has the deepest snowpack of any BEC zone found within the M-KMA.

The Graham Moist Very Cold Engelmann Spruce and Subalpine Fir (ESSFmv4) subzone and the parkland variant (ESSFmvp4) of this subzone cover more than 43 percent of the pre-tenure plan area. The subzone and variant are characterised by a very short growing season and long cold winters. Elevation ranges from 950-1600m and annual precipitation is 1200-1800mm with 50-70% as snow. Topography ranges from moderate to steep slopes.

Within the subzone, climax forests are dominated by Engelmann Spruce, Subalpine Fir and Lodgepole Pine. There is continuous forest cover at mid to low elevations. The lower elevations, which receive nutrient-laden seepage, have productive forests of Engelmann Spruce and Subalpine Fir. Timber harvesting interests are located in the accessible lower elevation portion of this zone. Snow avalanche tracks are common in the mountainous portions. Avalanche tracks are important spring and early summer habitat for black bear and grizzly bear.

Within the subzone parkland variant, clumps of trees occur within areas of heath, meadow and grassland. Forests are typically sparse and mixed with Krummholz conifers, willow and scrub birch. It is common on warm aspects, scattered Krummholz conifers occur throughout a dense cover of willow. A mix of exposed bedrock and scrubby willow vegetation dominates most of the steep northerly aspects.

Within the subzone and variant ungulates, including moose, caribou and mule deer, are widely distributed while elk, mountain goat and Stone's sheep are more restricted in distribution. Conifer forests are the most common vegetative cover and important furbearer (lynx, marten, fisher, wolverine) and seed-eating bird (red crossbill, white-winged crossbill, pine sisken, Clarks' nutcracker) habitat.

In high snowfall winter seasons when caribou cannot access open habitat terrestrial lichens, caribou rely exclusively on the abundant aboreal lichens within the mature conifer forests. Mountain goats inhabit the steep rugged south facing terrain on a year-round basis. Stone's sheep, which have much less tolerance to deep snow, are usually found in subalpine habitat in summer and fall. Wetlands and riparian habitats in these subzones are frequently not as productive as in lower elevation zones. However, moose, grizzly bear and black bear use this habitat.

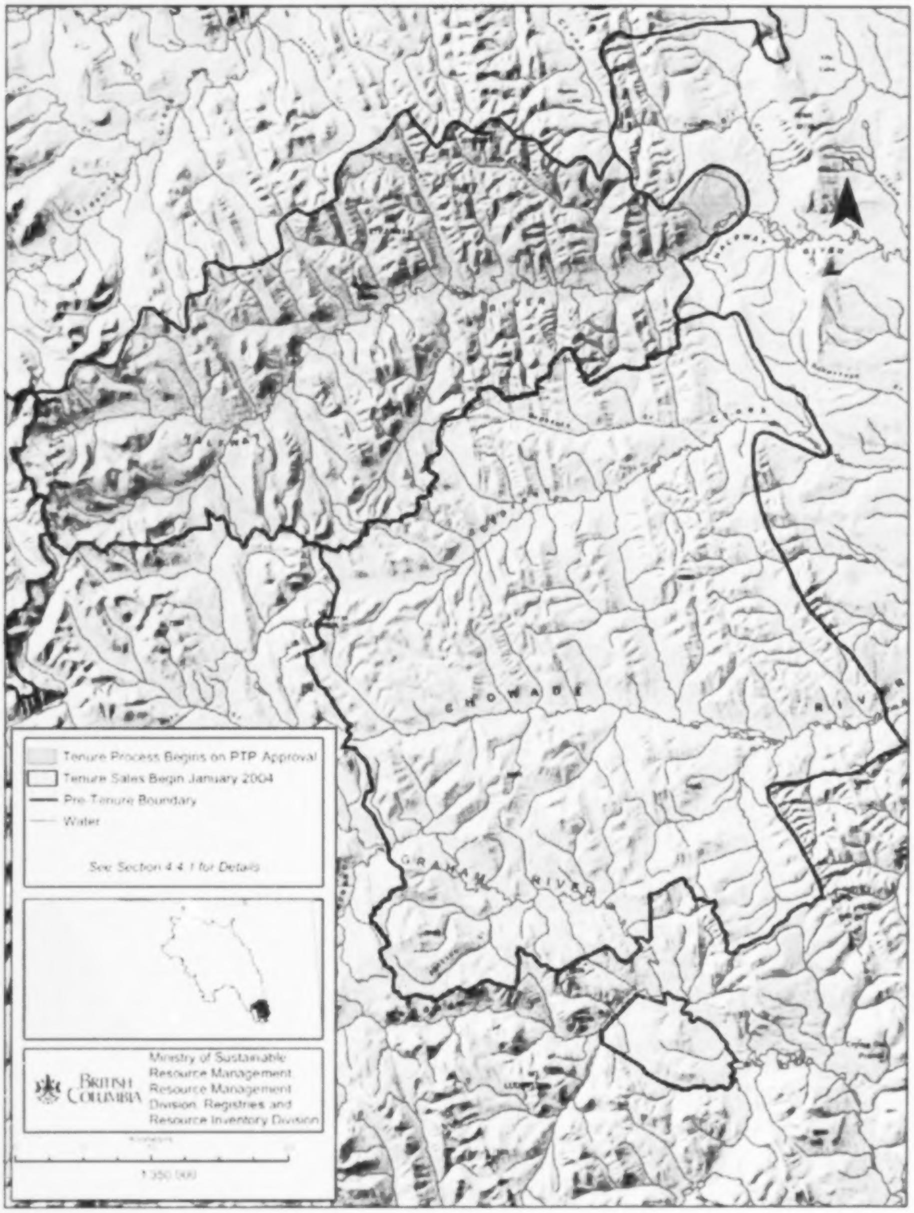
HALFWAY
CHOWADE
RIVER
GRAHAM RIVER
Tenure Process Begins on PTP Approval
Tenure Sales Begin January 2004
Pre-Tenure Boundary
Water
See Section 4.4.1 for Details
British Columbia
Ministry of Sustainable Resource Management
Resource Management Division, Registries and Resource Inventory Division
1:350,000

Figure 4-1: Halfway-Graham Pre-Tenure Planning Area

For a larger PDF version of this map, visit: http://srmwww.gov.bc.ca/rmd/ecdev/mog/.

Spruce Willow Birch - SWB

The Moist Cool-Spruce Willow Birch (SWBmk) subzone and the Scrub Variant (SWBmks) of this subzone cover over 22 percent of the pre-tenure plan area. The SWB BEC zone has the harshest climate of all the forested zones in British Columbia, second only to the non-forested AT zone. The climate is characterized by long, cold winters and brief, cool summers. Winter cold spells can be broken by Chinook winds. Mean annual precipitation is 460-700mm, with 35-60 percent occurring as snowfall. Elevation ranges from 900-1500m. The SWBmk subzone is restricted to the northern reaches above the Halfway River. Both the subzone and variant are usually the subalpine zone above the BWBS zone. Valleys can be steep sided with abundant colluvial fans and cones, and avalanche tracks often extend from upper slopes to the valley floor.

Valley bottoms within the subzone consist of closed to open conifer canopy forests of white spruce and localized Lodgepole Pine on rocky sites with a minimal trembling aspen component. Often, conifers will not establish on the valley floor due to cold air ponding but will grow on adjacent lower slopes. Trees are often damaged by wind, snow loading or avalanches.

Valley bottoms within the scrub variant are composed primarily of a non-forested mosaic of various willow species, scrub birch, wetlands and dry to moist grasslands. Mid slopes are dominated by Subalpine Fir, rarely greater than 9-10m in height and upper elevations by shrubs and willows.

Moose, caribou, grizzly bear and black bear are found in the subzone and variant, particularly in summer. If snow levels are not too deep, valley bottoms provide winter range for moose and caribou. Caribou paw or nuzzle through the snow for terrestrial lichens. Where suitable steep, rugged terrain occurs, mountain goat are found year-round. Stone's sheep may be found where steep south facing grasslands associated with rugged terrain occur. Reduced snow depth on open south facing slopes favour Stone's sheep, mountain goat and moose. Furbearers (e.g., lynx, wolverine, beaver, mink) are found within the subzone and variant.

Although not native to this subzone and variant, a population of plains bison occurs in this area, the result of an introduction in the 1970's.

Wetlands and shallow lakes, although not as extensive or productive as those found in the BWBS BEC zone, are important for moose browse production and provide summer habitat for various species of waterfowl. Beaver are the most common furbearer associated with this habitat, and otter, mink and muskrat may also be present.

Boreal White and Black Spruce - BWBS

The Peace Moist Warm Boreal White and Black Spruce (BWBSmw1) and the Graham Wet Cool Boreal White and Black Spruce (BWBSwk2) variants cover more than 10 percent of the pre-tenure plan area. Both variants are exclusive to this pre-tenure plan area. The BWBSmw1 occupies the lower reaches of the Chowade River drainage and the BWBSwk2 is found in the lower reaches of the Halfway and Graham River drainages. These variants are characterized by a short growing season, frequent outbreaks of arctic air masses and long cold winters. Annual precipitation is 330-570mm with 35-55 percent as snow. Topography ranges from flat to moderate slopes.

The BWBSmw1 variant has a drier and cooler growing season than the BWBSmw2 variant, but the winters are warmer and wetter.

Trembling aspen dominates the better drained plateau, foothill and cordilleran sites. White spruce is present on moist to wetter sites and lodgepole pine is on drier and nutrient poor sites. Black spruce, with some tamarack, is common on compacted morainal and lacustrine soils. Forest fires are frequent, maintaining most of the forests in various structural stages.

Riparian habitats and south-facing aspen forests within these variants provide year-round habitat for moose, caribou, elk, mule deer, gray wolf, black bear and furbearers (lynx, marten, beaver and muskrat). Low elevation wetlands provide seasonal habitat for large numbers of waterfowl and patches of deciduous and willow provide productive bird (e.g., warblers, thrushes, vireos, flycatchers) and small mammal habitat.

Alpine Tundra - AT

The AT zone covers over 23 percent of the pre-tenure plan area. Generally, this zone occurs above 1800m and is characterized by a climate that is very cold, windy, snowy and has low growing season temperatures. Annual precipitation is 700-3000mm with 70-80 percent as snow. Frost can occur at any time of the year.

By definition, this zone is treeless, but stunted conifer species (e.g., Engelmann and white spruce), willow and scrub birch are common at lower elevations. Vegetation is dominated by shrubs, herbs, bryophytes and lichens; soil development is weak to non-existent. Much of the zone consists of steep, rocky cliffs; coarse colluvial veneers; and non-vegetated, morainal tills.

Wildlife diversity is low. Stone's sheep winter on steep, windswept, south-facing terrain and caribou on windswept plateau habitat. Where topography permits, several wildlife species (e.g., elk, grizzly bear, black bear, wolverine) are found in this zone in summer and fall, particularly in the stunted conifer habitat.

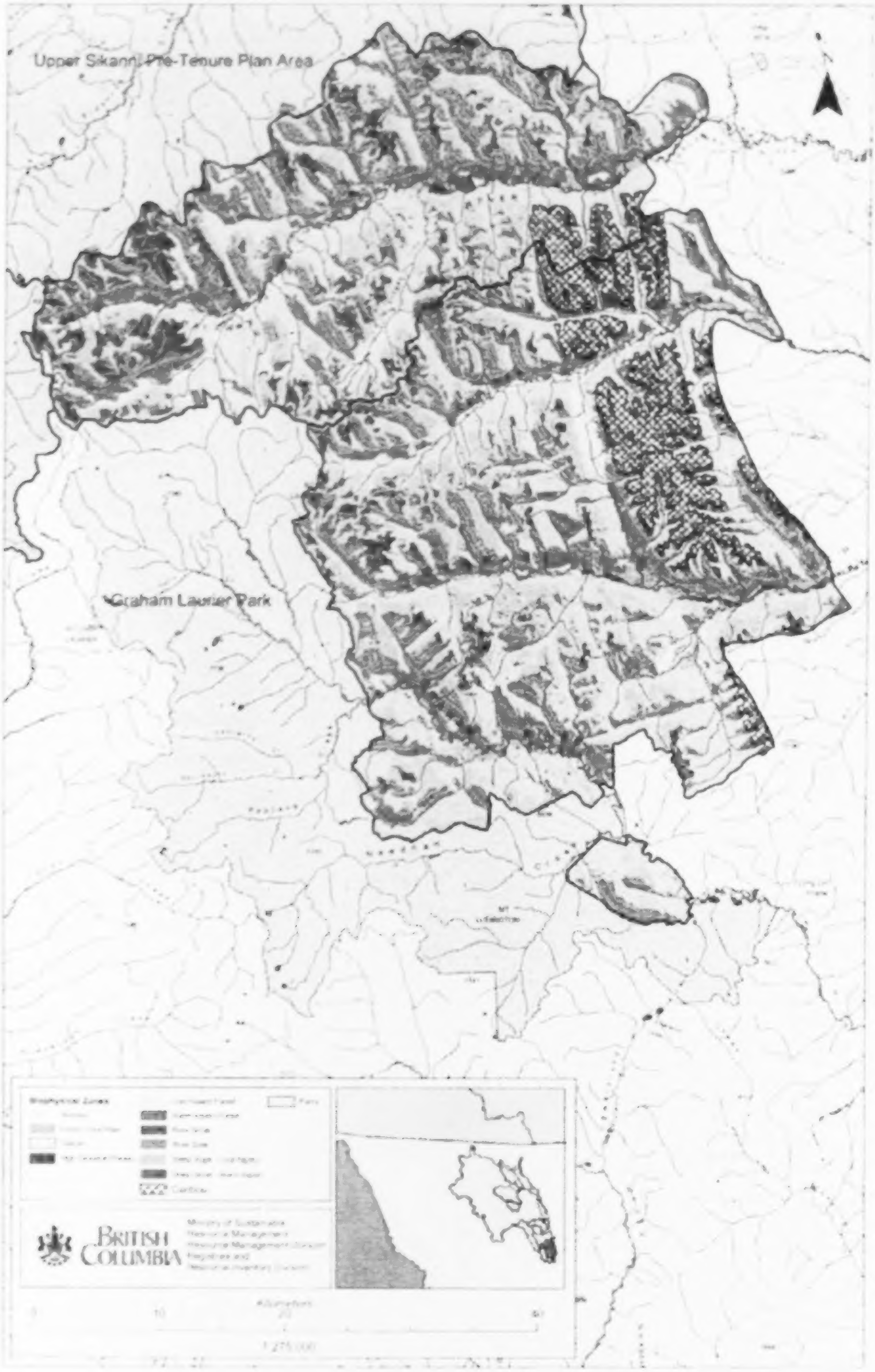
Upper Sikanni Pre-Tenure Plan Area
Graham Laurier Park
BRITISH COLUMBIA
10
20

Figure 4-2: Biophysical Zones in the Halfway-Graham area

For a larger PDF version of this map, visit: http://srmwww.gov.bc.ca/rmd/ecdev/mog/.

4.2.2 Distribution of Biophysical Zones

Table 4-1 details the percentage and hectares that each biophysical zone contributes to the HG pre-tenure plan area. Figure 4-2 delineates the biophysical zone boundaries within the HG pre-tenure plan area. See Chapter 8 for MSRM responsibilities in monitoring impacts to biophysical zones.

Recent caribou radio telemetry fieldwork within and south of the HG pre-tenure plan area indicate that during mid to late winter, caribou inhabit a variety of biophysical zones, including: High Elevation Plateau, Warm/Cool Aspect Forest and Steep Warm/Cool Aspect Zones. Incorporating this telemetry information and local expert knowledge, a Caribou Zone, bounded by the 1400m elevation contour, is delineated along the eastern edge of the pre-tenure plan area. The Caribou Zone is an "overlay" delineation that visually highlights the importance of existing biophysical zones for caribou winter habitat. Therefore, the Caribou Zone does not spatially contribute to the pre-tenure plan hectare total. The Caribou Zone only occurs in the HG pre-tenure plan area.

Table 4-1: Distribution of Biophysical Zones in the Halfway-Graham Pre-Tenure Plan Area

BIOPHYSICAL ZONE	HALFWAY-GRAHAM PTP AREA	
	Hectares	Percent
Low Elevation Wetland	7500	3.2
Warm Aspect Forest (<45% slope)	44056	18.8
Cool Aspect Forest (<45% slope)	79961	34
River	1059	0.5
Forested Floodplain	4169	1.8
River Break	N/A	N/A
Steep Cool Aspect (>45%slope)	46702	19.9
Steep Warm Aspect (>45% slope)	29918	12.7
High Elevation Plateau	21327	9.1
Glacier	210	0.09
***Caribou**	-	-
Total	**234902**	**100**

* Caribou Zone does not spatially contribute to the PTP hectare total

4.2.3 Resource Values

Table 4-2 summarizes both key and unique resource values and uses in the Halfway Graham pre-tenure plan area including both ongoing and anticipated activities.

Table 4-2: Key and Unique Resource Values and Uses in the Halfway-Graham Pre-Tenure Plan Area

Key Resource Values	Description
Wildlife	➢ ungulates: moose, elk, caribou, Stone's sheep, mountain goat ➢ predators: e.g. wolf, grizzly bear, wolverine ➢ furbearers: e.g. wolverine, lynx, marten, beaver ➢ stable population of plains bison inhabit the northern portion of the area in the Halfway River drainage
Fish	➢ Bull trout Wildlife Habitat Areas (WHA) ➢ all major sport fishing species (e.g. arctic grayling, mountain whitefish, rainbow trout) present in major watersheds ➢ resident bull trout upstream of Christina Falls on the Graham River
Biophysical Zone	➢ Caribou Zone delineating caribou critical winter habitat along the eastern edge of the PTP area
Oil and Gas	➢ potential rated as high to very high as per Ministry of Energy and Mines projections (potential estimated at 829 to 1736 billion cubic feet of gas in place)
Other Industrial Uses	
Mineral Exploration	➢ mineral potential varies from low to high. ➢ Significant lead-zinc mineralization in the Robb Lake area has been explored intermittently since the 1970's and mineral tenures exist in this area.
Forestry	➢ merchantable timber in the valleys and foothills of the southern portion of the PTP area.
Guide Outfitters	➢ guide outfitters operate in the PTP area - have small base camps, airstrips, cabins, horse corrals and trail access network
Trapping	➢ trappers operate in the PTP area - have trapline cabins and trail access network
Geothermal	➢ moderate low temperature potential.
Non-Industrial Uses	
First Nations	➢ cultural and heritage values. ➢ traditional use sites.
Range	➢ range tenures associated with First Nations, guide outfitters, commercial horse operators, non-commercial hunters, trappers and recreationists.
Recreation	➢ both resident and non-resident activities. Includes: hiking, ATVing, river boating, horse riding, resident hunting. ➢ the *Historic High Trail* present in PTP area. ➢ the *Peace River-Yukon Heritage Trail* located in the Cypress River drainage. ➢ designated motorized access routes in the Chowade, Halfway, Graham and Cypress drainages.
Commercial Recreation	➢ there is potential for licensed commercial recreation activities in the PTP area.

4.2.4 First Nation and Cultural Values

The Halfway-Graham area has historic and current use by several First Nations who are signatories to Treaty 8, a historic treaty signed at the turn of the last century. This Treaty covers the northeast part of BC as well as parts of Alberta, Saskatchewan and the Northwest territories. These Treaty 8 First Nations include the Halfway River, Blueberry River, West Moberly and Saulteau First Nations, all of which primarily speak languages classified in the Northern Athapaskan language family.

The Halfway River First Nation has one reserve, north of Fort St. John with 137 members living on reserve out of 215 registered First Nation members (as of December 2002). The Halfway River and the West Moberly First Nations were formerly one First Nation and referred to as the Hudsons' Hope Band. They were divided into two Bands in 1975. The Halfway River is primarily of Beaver and Sekani descent.

The West Moberly First Nation has one reserve located at the west end of Moberly Lake about 90 km southwest of Fort St. John, with 163 registered First Nation members as of December 2002.

The Halfway River and West Moberly First Nation are currently in negotiations for a treaty land entitlement claim with Canada and BC. There is some potential to select all or a portion of lands within the Halfway-Graham pre-tenure plan area, but the final selection would be subject to negotiation with Canada and BC.

The Saulteau First Nation has one reserve located at the east end of Moberly Lake about 100 km southwest of Fort St. John, with 778 registered First Nations members as of 2001.

The Blueberry River First Nation has two reserves (Blueberry IR No. 205 and Beaton River IR No. 204) north of Fort St. John. At one time, the Blueberry River and Doig River were part of the Fort St. John Band until 1977 when they were divided. Primarily of Beaver and Cree decent, the 2002 registered Blueberry River population was 363 members with 154 of those members residing on the Blueberry IR No 205 reserve.

The Halfway-Graham pre-tenure plan area supports uses and contains values and resources of importance to these First Nations including hunting, fishing and trapping areas (including some registered trap lines), old cabins and village sites, historic trails and other traditional use sites. It is fully expected that there are a number of sites that are not yet documented. The General Planning and Management Direction within Chapter 3 stresses consultation with First Nations to enable location of sites, possibly through site-specific assessments as necessary; confidentiality of this information is also recognized, subject to freedom of information legislation. Chapter 3 further stresses the use of appropriate measures to avoid impacts to important sites.

Two significant historic trails used by First Nations, the Peace River – Yukon Heritage Trail and the High Trail, are located within this pre-tenure plan area.

4.3 Management Direction

Section 3.2 (Management Direction) describes strategic level criteria and elements applicable to all pre-tenure plan areas and provides management objectives, indicators and targets.

The following section provides management direction to protect values unique to the HG pre-tenure plan area. Management direction is expressed as criteria and elements and the subsequent objective, indicator, target(s) and outputs (in a format similar to Section 3.2). Information sources needed to achieve the targets are provided as footnotes or in Section 4.4.

Criteria	Elements
1. Conserve or Protect Wildlife Diversity	➢ Conserve plains bison diversity ➢ Protect bull trout Wildlife Habitat Areas ➢ Protect resident bull trout population upstream of Christina Falls ➢ Caribou Zone
2. Historical and Designated Access	➢ Conserve the Historic High Trail and Peace River-Yukon Heritage Trail ➢ Continued year-round public use of designated motorized access routes
3. Forest Land Productivity	➢ Maintain forest land productivity.

Consultations with First Nations may identify resource uses and heritage sites that are unique to the Halfway-Graham area. While this is not identified in the above table, it is fully expected that these will be addressed through the management direction provided in Chapter 3.

CRITERION 1 CONSERVE OR PROTECT SPECIES DIVERSITY

By achieving this criterion, the integrity, function and habitat of wildlife unique to the HG pre-tenure plan area, is accomplished.

Element 1.1 Conserve Plains Bison Diversity

Plains bison are a provincially blue listed species. The population of plains bison in the Halfway River drainage is a component of one of the world's largest herds. Plains bison are predominantly grazers and inhabit the open grasslands and meadows of the Halfway River Valley and the surrounding mountainous areas.

Diet varies by season. Winter diet is composed almost exclusively of sedges; in spring and summer, their diet includes a diverse mix of sedges, grasses and shrubs. In late summer and fall, lichen and forbs become more dominant.

Bison are found at various elevations and habitats throughout the year and regularly found in subalpine and alpine habitats in winter. They can forage in several feet of loose snow.

Objective	Indicator	Target	Output
The structure, function and distribution of both plains bison habitat and behavior remains in a natural range.	Proportion and amount of disturbance (% and ha) by biophysical zone.	For target information, refer to Element 1.2 - *Conservation of Species Diversity* -in Section 3.2	Overview Assessment Site-level Assessment Restoration Plan Operations Monitoring Record

Element 1.2 Protect Bull Trout Wildlife Habitat Areas

Bull trout are a provincially blue listed species. Limiting habitat essential for bull trout survival are staging, spawning and over-wintering congregation areas. Within the pre-tenure plan area, selected locations of this limiting habitat are designated as Wildlife Habitat Areas (WHA).

Objective	Indicator	Target	Output
Maintain ecological integrity of bull trout WHA's.	Ecological integrity of bull trout WHA's.	Activities conducted within Wildlife Habitat Areas are consistent with the requirements of the WHA and the Identified Wildlife Management Strategy (see Section 4.4 for information sources).	Overview Assessment Site-level Assessment Restoration Plan Operations Monitoring Record

Achieving the Target:

The IWMS provides general wildlife measures that describe the management practices required to meet the needs of bull trout WHAs. The management objectives are:

- avoid creating access to bull trout congregation sites; and
- maintain stream channel integrity, ground water flow, substrate composition, cover and natural temperature regimes.

Refer to the IWMS website at:

http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/other/wild/part2-01.htm#bull
for additional detailed bull trout WHA management information.

Element 1.3 Protect Resident Bull Trout Population Upstream of Christina Falls

Christina Falls on the Graham River is a migration barrier to bull trout populations above the falls. Important bull trout habitat exists above the falls to sustain the fish population(s). Bull trout habitat includes spawning habitat, instream and overstream cover elements and larger pools or areas with upwelling ground water that are used as over-wintering habitat.

Objective	Indicator	Target	Output
Maintain ecological integrity of bull trout habitat upstream of Christina Falls.	Ecological integrity of bull trout habitat.	Activities are conducted in this area in a manner consistent with bull trout WHAs.	Overview Assessment Site-level Assessment Restoration Plan Operations Monitoring Record

Achieving the Target:

Where proposed activities may affect important bull trout habitat, a site-specific assessment should be undertaken to identify the locations of spawning habitat, cover elements and pools or upwelling areas used as over-wintering habitat. These habitats should then be managed to meet the needs of bull trout WHAs.

Element 1.4 Caribou Zone

As described in Section 4.2.2, the caribou zone does not contribute to the hectare total, but it has been mapped and it highlights the area known to be inhabited by caribou. This caribou population has been identified as threatened under the federal *Species at Risk Act* and as such, a species recovery plan will have to be developed by government. As this recovery plan evolves, it may present opportunities to undertake adaptive management measures in oil and gas development planning.

Objective	Indicator	Target	Output
Maintain ecological integrity of the caribou zone.	Proportion and amount of disturbance (% and ha) of biophysical zones within the caribou zone.	Achieving the Target for Element 1.2 - *Conservation of Species Diversity* in Section 3.2 will address this objective. Consider opportunities for adaptive management measures in development planning that may complement a species recovery plan once it is developed.	Overview Assessment Site-level Assessment Restoration Plan Operations Monitoring Record

CRITERION 2 HISTORICAL AND DESIGNATED ACCESS

There are both designated motorized access routes and trails of historical significance located in several major drainages of the pre-tenure plan area. It is recognized that proposed access for oil and gas activities will often be located along similar routes and that in some instances, local physiography restricts any opportunity to avoid overlap of proposed and existing or historic access routes. There may be less overall environmental impact when proposed and existing access routes do overlap.

Some trails are designated heritage sites under the *Heritage Conservation Act.*[20] The intent of heritage designation is not to necessarily prohibit development activities in designated areas, but to place such constraints as are necessary and practical to maintain the integrity of the trail as a heritage site. MSRM is responsible for the *Heritage Conservation Act*. MSRM and the OGC have a protocol agreement that addresses assessing and managing impacts on archaeological sites from oil and gas exploration and development and pipeline activities.[21] This protocol agreement sets out responsibilities for archaeological overview assessments, archaeological impact assessments and impact management. The OGC is responsible for issuing authorizations where impacts to heritage trails are unavoidable.

Element 2.1 Conserve the Historic High Trail and Peace River-Yukon Heritage Trail

Historically, First Nations travelled throughout the M-KMA to undertake various activities including trading and hunting. The "High Trail" was a major route First Nations used to travel in a north/south direction through northeast BC including much of the M-KMA.

In the early part of the last century, the Royal North West Mounted Police used a trail that linked the Peace country to the Yukon. Today, this trail is known as the Peace River-Yukon Trail and within BC has been designated as a heritage trail.[22] Within the pre-tenure plan area, the trail travels the length of the Cypress River drainage.

Objective	Indicator	Target	Output
Conserve historic and heritage trails.	Meters of trail disturbance.	Protect the Peace River-Yukon Heritage Trail as per the *Heritage Conservation Act*. Minimize adverse impact to the historical High Trail.	Overview Assessment Site-level Assessment Restoration Plan Operations Monitoring Record

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[20] The *Heritage Conservation Act* can be found at: http://www.qp.gov.bc.ca/statreg/stat/H/96187_01.htm

[21] This protocol agreement can be viewed at: http://srmwww.gov.bc.ca/arch/policy/oilgas.htm.

[22] Heritage trails are designated as heritage sites under Section 9 of the *Heritage Conservation Act*; this designation means that the site/trail has heritage value to British Columbia, a community or an Aboriginal people.

Element 2.2 Continued Year-Round Public Use of Designated Motorized Access Routes

Motorized access within the pre-tenure plan area is restricted to access routes designated under the *Wildlife Act*. These routes have been selected based on environmental sensitivity, public recommendation and past use. Motorized access routes are located in the Chowade, Cypress and Halfway River drainages.[23]

Objective	Indicator	Target	Output
Ensure year-round public access of all designated motorized access routes.	Availability of public access on designated motorized access routes.	Where oil and gas access routes coincide with designated routes, ensure public access is maintained and ensure safety measures are in place where recreational and industrial traffic share the same access route.	Consultation record with non-industrial users Site-level Assessment Access Management Plan Restoration Plan Operations Monitoring Record

CRITERION 3 FOREST LAND PRODUCTIVITY

Element 3.1 Maintain Forest Land Productivity

The forestry resource, particularly on the lower slopes of the Graham River drainage, possesses saw-log timber and some potential pulpwood. Given the fire origin most pine and spruce stands are of a uniform density and singled storied structure.

Objective	Indicator	Target	Output
No adverse impact to pre-development forest land productivity	Kilometres of access coordinated with forestry industry	Coordinated development of access with forestry industry where opportunities exist (see Element 3.4 *Non-Energy Benefits*, in Section 3.2).	Consultation record with the forest industry Operations monitoring record Restoration plans
	Hectares of disturbance to productive forest lands	Forest lands are restored to simulate pre-development conditions for forest productivity over time.	

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[23] Maps of these access routes and other information are available at: http://srmwww.gov.bc.ca/rmd/lrmp/mk/mk0301/maps/access/routes.html

Achieving the Target:

Restoring forest lands to simulate pre-development conditions for forest productivity over time requires re-establishing the tree species that were removed. This should be consistent with the management direction provided in Section 3.2 under Element 1.4, *Ecosystem Restoration*.

4.4 Halfway-Graham Pre-Tenure Plan Information Sources

This section identifies information sources from the predictive ecosystem mapping completed for pre-tenure plans, LRMPs and other sources specific to the Halfway-Graham area. It also provides guidance to a pre-tenure plan user on how to find data used in this document, such as the zone map layers in digital formats.

Website address for:

- Biogeoclimatic Information http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Trapping Tenures http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Guide Outfitter Tenures http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Biophysical zone map of the HG pre-tenure plan area http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Focal species winter habitat capability http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Identified Wildlife Management Strategy http://wlapwww.gov.bc.ca/wld/identified/
- *Heritage Conservation Act* http://www.qp.gov.bc.ca/statreg/stat/H/96187_01.htm
- Designated Motorized Access Routes http://srmwww.gov.bc.ca/rmd/lrmp/mk/mk0301/maps/general/over.htm

5. BESA-PROPHET PRE-TENURE PLAN AREA

This pre-tenure plan is scheduled to be completed in 2004 (see Figure 1 in Preface).

6. MUSKWA-WEST PRE-TENURE PLAN AREA (SOUTHERN PORTION)

6.1 Plan Area Location

The Muskwa-West pre-tenure plan area adjoins the eastern edge of the Northern Rocky Mountains Park within the M-KMA (Figure 6-1). There are two separate portions to the Muskwa-West area, a northern and a southern portion, separated by a strip of the Northern Rocky Mountains Park along the Tuchodi River. The southern portion encompasses 97,657 hectares. This southern portion of the area is bordered to the north by the Tuchodi River portion of the Northern Rocky Mountains Park and to the south by the Besa Prophet area. The eastern edge of pre-tenure plan area is a portion of the eastern boundary of the M-KMA.

6.1.1 Oil and Gas Tenure Disposition in the Plan Area

The Ministry of Energy and Mines is responsible for the disposition of all oil and gas tenures. A staged approach for tenure disposition is being used in the Muskwa-West area. Once approved, this plan will apply to only the southern portion of the Muskwa-West pre-tenure planning area, south of the Tuchodi River. Following approval, the Ministry of Energy and Mines will accept requests for tenure postings in this southern portion of the Muskwa-West area. Figure 1 (see Preface) illustrates this approach.

6.2 Biophysical and Resource Values and Uses

The topography of the Muskwa-West pre-tenure plan area is relatively moderate. The elevation ranges from 500m in the foothills along the eastern extent of the pre-tenure plan area up to 1700m in the west along the edge of the mountains. Portions of the Muskwa, Kluachen, Ghato, Bat, and Milken drainages are within the pre-tenure plan area.

Two BEC zones cover the pre-tenure plan area: Boreal White and Black Spruce (BWBS), Spruce Willow Birch (SWB).

6.2.1 Biogeoclimatic Zones

Boreal White and Black Spruce - BWBS

The Fort Nelson Moist Warm Boreal White and Black Spruce (BWBSmw2) variant covers more than 95 percent of the pre-tenure plan area. This variant has a wetter and warmer growing season, and a cooler and drier winter than the Peace Variant to the south.

This variant is characterized by a short growing season, frequent outbreaks of arctic air masses and long cold winters. Annual precipitation is 330-570mm with 35-55 percent as snow. Topography ranges from flat to moderate slopes. This variant occupies areas below 1030m elevation and is bounded at upper elevations by the SWBmk subzone.

Trembling aspen and white spruce dominate the better drained sites while black spruce in combination with tamarack is found on poorly drained sites. Lodgepole pine is relatively common in combination with black spruce or on well-drained higher elevation sites.

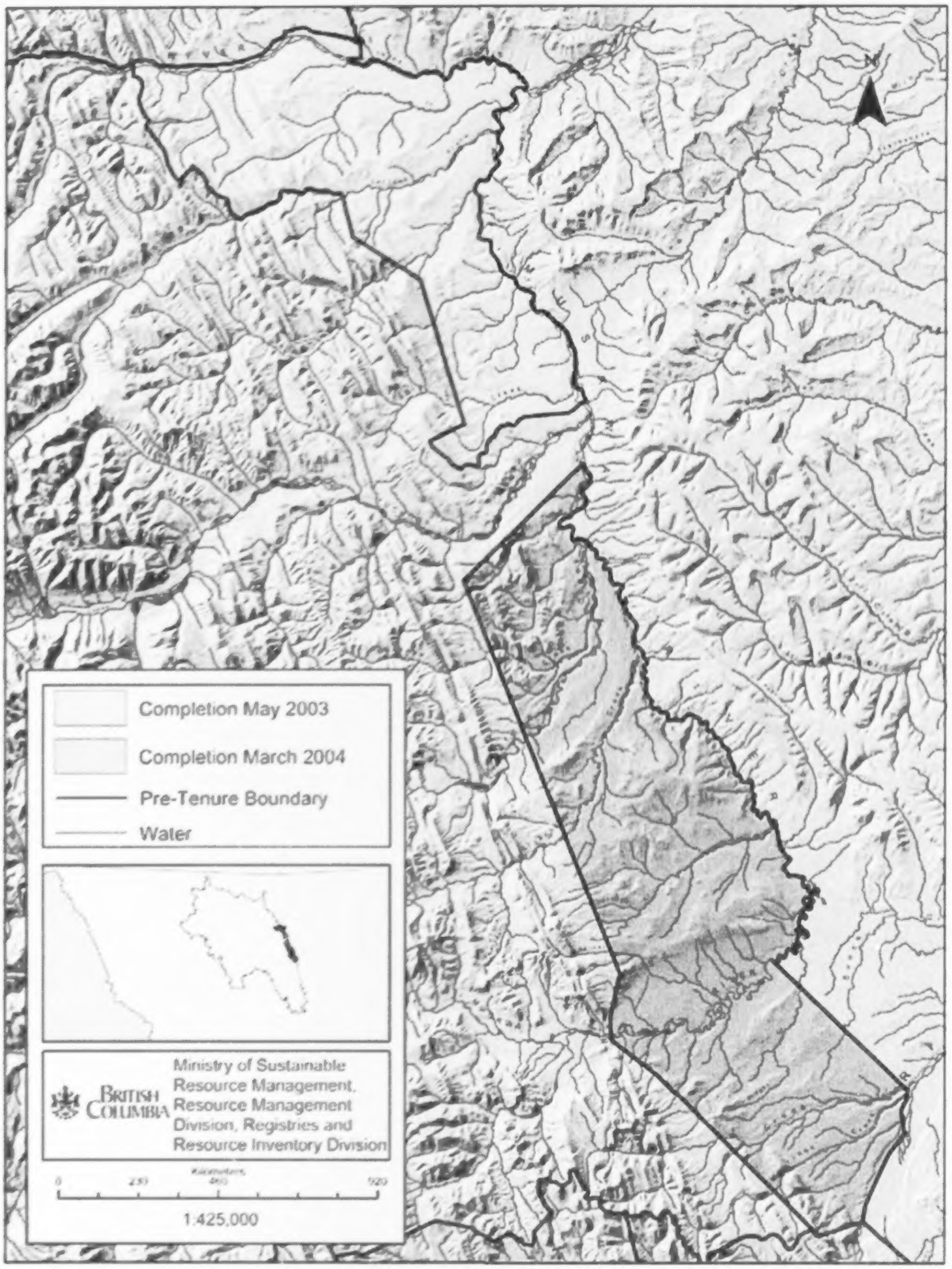
Completion May 2003
Completion March 2004
Pre-Tenure Boundary
Water
British Columbia
Ministry of Sustainable Resource Management, Resource Management Division, Registries and Resource Inventory Division
Kilometers
0
230
460
920
1:425,000

Figure 6-1: Muskwa West Pre-Tenure Planning Area

For a larger PDF version of this map, visit: http://srmwww.gov.bc.ca/rmd/ecdev/mog/.

The lowland areas within the variant provide winter habitat for populations of caribou, black bear and furbearers (e.g. lynx, marten, beaver, and muskrat). Riparian habitat and south facing aspen forests provide year-round habitat for moose, elk, grizzly bear and wolf. Numerous wetlands support large numbers of waterfowl such as mallard, northern pintail, blue-winged teal and northern shoveler, and shorebirds.

Spruce-Willow Birch - SWB

The Moist Cool Spruce-Willow Birch (SWBmk) subzone covers 5 percent of the pre-tenure plan area and is restricted to the northwest corner of the area. The SWB BEC zone has the harshest climate of all the forested zones in British Columbia, second only to the non-forested AT zone. The climate is characterized by long, cold winters and brief, cool summers. Winter cold spells can be broken by Chinook winds. Mean annual precipitation is 460-700mm, with 35-60 percent occurring as snowfall. Elevation ranges from 900-1500m. This is the subalpine subzone above the BWBS zone. Valleys can be steep sided with abundant colluvial fans and cones, and avalanche tracks often extend from upper slopes to the valley floor.

Valley bottoms within the subzone consist of closed to open canopy conifer forests of white spruce and localized lodgepole pine on rocky sites with a minimal trembling aspen component. Often, conifers will not establish on the valley floor due to cold air ponding but will grow on adjacent lower slopes. Trees are often damaged by wind, snow loading or avalanches.

Within the subzone, moose, caribou, grizzly bear and black bear are found, particularly in summer. If snow levels are not too deep, valley bottoms provide winter range for moose and caribou. Caribou paw or nuzzle through the snow for terrestrial lichens. Where suitable steep, rugged terrain occurs, mountain goat are found year-round. Stone's sheep may be found where steep south facing grasslands associated with rugged terrain occur. Reduced snow depth on open south-facing slopes favour Stone's sheep, mountain goat and moose. Furbearers (e.g., lynx, wolverine, beaver and mink) are found within the subzone.

Wetlands and shallow lakes, although not as extensive or productive as those found in the BWBS BEC zone, are important for moose browse production and provide summer habitat for various species of waterfowl. Beaver are the most common furbearer associated with this habitat, and otter, mink and muskrat may also be present.

6.2.2 Distribution of Biophysical Zones

Table 6.1 shows the percentage and hectares that each biophysical zone contributes to the MW pre-tenure plan area. Figure 6-2 delineates biophysical zone boundaries within the Muskwa-West pre-tenure plan area. See Chapter 8 for MSRM responsibilities in monitoring impacts to biophysical zones.

Table 6-1: Distribution of Biophysical Zones in the Muskwa West Pre-Tenure Plan Area

BIOPHYSICAL ZONE	MUSKWA WEST PTP AREA (southern portion)	
	Hectares	Percent
Low Elevation Wetland	14832	15.1
Warm Aspect Forest (<45% slope)	26741	27.4
Cool Aspect Forest (<45% slope)	44202	45.3
River	488	0.5
Forested Floodplain	5937	6.1
River Break	4488	4.6
Steep Cool Aspect (>45% slope)	683	0.7
Steep Warm Aspect (>45% slope)	286	0.3
High Elevation Plateau	N/A	N/A
Glacier	N/A	N/A
Total	**97657**	**100**

6.2.3 Resource Values and Uses

Table 6-2 summarizes both key and unique resource values and uses in the Muskwa-West pre-tenure plan area, including both ongoing and anticipated activities.

Table 6-2: Key Resource values and Uses in the Muskwa West Pre-Tenure Plan Area

Key Resource Values	Description
Wildlife	➢ ungulates: moose, elk, caribou, deer , possibly Stone's sheep and mountain goat ➢ predators: e.g. wolf, grizzly bear, wolverine ➢ furbearers: e.g. wolverine, lynx, marten, beaver
Fish	➢ all major sport fishing species (e.g. arctic grayling, mountain whitefish, rainbow trout) present in major watersheds
Oil and Gas	➢ potential rated as high to very high as per Ministry of Energy and Mines projections (543 to 986 billion cubic feet of gas in place)
Biophysical Zone	➢ River Break Biophysical Zone
Visual Quality	➢ Visual Quality from the Muskwa River (recreational river boating)
Forested Wetlands	➢ Large areas of wetlands intermixed with forests (Note: not a delineated biophysical zone)

Key Resource Values	Description
Other Industrial Uses	
Mineral Exploration	➢ mineral potential varies from low to high
Forestry	➢ approximately 3500 hectares of merchantable timber
Guide Outfitters	➢ guide outfitters operate in the PTP area – have small base camps, airstrips, cabins, horse corrals and trail access network
Trapping	➢ trappers operate in the PTP area – have trapline cabins and trail access network
Geothermal	➢ low potential except for small area of medium in southwest portion
Non-Industrial Uses	
First Nations	➢ cultural and heritage values ➢ traditional use sites
Range	➢ range tenures associated with First Nations, guide outfitters, commercial horse operators, non-commercial hunters, trappers and recreationists
Recreation	➢ both resident and non-resident activities. Includes: hiking, ATVing, river boating, horse riding, resident hunting
Commercial Recreation	➢ potential licensed commercial recreation activities

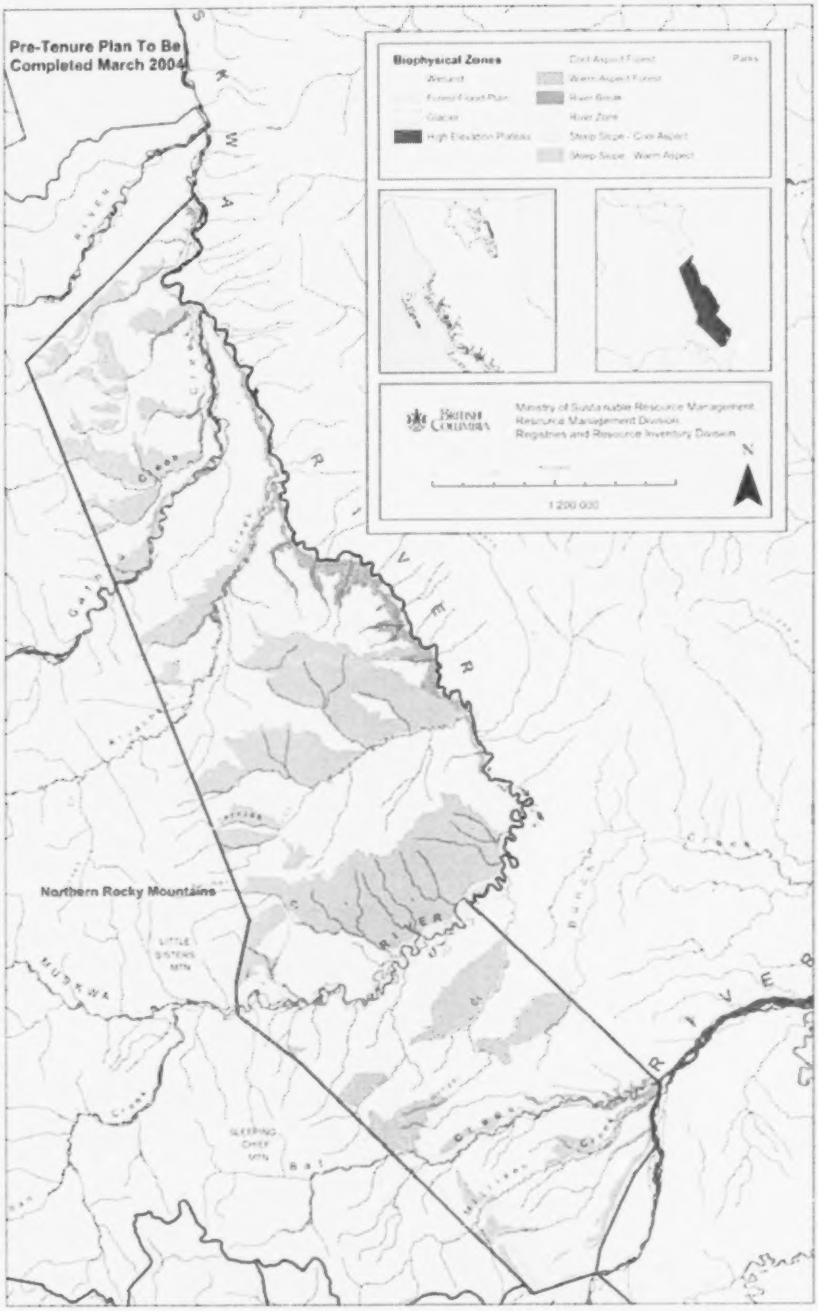
Pre-Tenure Plan To Be Completed March 2004
Biophysical Zones
Wetland
Forest Flood Plain
Glacier
High Elevation Plateau
Cool Aspect Forest
Warm Aspect Forest
River Break
River Zone
Steep Slope - Cool Aspect
Steep Slope - Warm Aspect
Parks
British Columbia
Ministry of Sustainable Resource Management
Resource Management Division
Registries and Resource Inventory Division
N
1:200 000
SIKANNI CHIEF RIVER
Northern Rocky Mountains
LITTLE SISTERS MTN
MUSKWA
SLEEPING CHIEF MTN
RIVER

Figure 6-2: Biophysical Zones in the Muskwa West area

For a larger PDF version of this map, visit: http://srmwww.gov.bc.ca/rmd/ecdev/mog/.

6.2.4 First Nation and Cultural Values

The Muskwa-West area (southern portion) has historic and current use by the Prophet River and Fort Nelson First Nations. The Prophet River and Fort Nelson First Nations are signatory Nations to Treaty 8, a historic treaty signed at the turn of the last century. This treaty covers the northeast part of BC as well as parts of Alberta, Saskatchewan and the Northwest territories. These First Nations primarily speak languages classified in the Northern Athapaskan language family.

The Prophet River First Nation has one reserve located approximately 100 km south of Fort Nelson with 195 registered First Nation members as of December 2002.

The Fort Nelson First Nation has five reserves, with the largest reserve located just east of Fort Nelson, and three smaller reserves located on the Fontas River, Kahntah River and Sahtaneh River. There are 721 registered Fort Nelson First Nation members as of February 2003.

The Muskwa-West PTP area supports uses and contains values and resources important to these First Nations including trapping, fishing, hunting, traditional use, archaeological, cultural and heritage sites. It is fully expected that there are a number of sites that are not yet documented. The General Planning and Management Direction within Chapter 3 stresses consultation with First Nations to enable location of sites, possibly through site-specific assessments as necessary; confidentiality of this information is also recognized subject to freedom of information legislation. Chapter 3 further stresses the use of appropriate measures to avoid impacts to important sites.

6.3 Management Direction - Objectives

Section 3.2 (Management Direction) describes strategic level criteria and elements applicable to all pre-tenure plan areas and provides management objectives, indicators and targets.

The following section provides management direction to protect values unique to the Muskwa-West pre-tenure plan area. Management direction is expressed as criteria and elements and the subsequent objective, indicator, target(s) and outputs (in a format similar to Section 3.2). Information sources needed to achieve the targets are provided as footnotes or in Section 6.4.

Criteria	Elements
1. Terrain Stability	➢ River Break Biophysical Zone
2. Visual Quality	➢ Visual quality from the Muskwa River and navigable waters draining into the Muskwa River
3. Forested Wetlands	➢ Maintain ecological integrity of forested wetlands
4. Forest Land Productivity	➢ Maintain forest land productivity

Consultations with First Nations may identify resource uses and heritage sites that are unique to the Muskwa-West area. While this is not identified in the above table, it is fully expected that these will be addressed through the management direction provided in Chapter 3.

CRITERION 1 TERRAIN STABILITY

Element 1.1 River Break Biophysical Zone

Much of the surficial material within the pre-tenure plan area is a result of past glacial, glacier lake, and meltwater activities. Resulting material deposits typically consist of interlayered silt, clay, and fine sands. In post-glacial times the Muskwa River, and the lower reaches of the major drainages discharging into the Muskwa, downcut into these deposits creating continuous steep-sided scarps, which are unstable, non-vegetated, and subject to constant erosion.

Objective	Indicator	Target	Output
No increase in river scarp instability.	Locations of increased river scarp instability due to oil and gas activities.	0% increase in river scarp instability due to oil and gas activity.	Overview Assessment Site-specific Assessments (terrain stability assessments) Restoration Plan Operations monitoring record

CRITERION 2 VISUAL QUALITY

Element 2.1 Visual Quality from the Muskwa River and Navigable Waters Draining into the Muskwa River

Within the pre-tenure plan area, relatively high levels of recreational watercraft activity seasonally occur on the Muskwa River and navigable waters discharging into the river. Viewscapes from these watercourses are important. Oil and gas activities on terrain visible from navigable watercourses must be conducted in a manner that minimizes impact to visual quality.

Objective	Indicator	Target	Output
Minimize adverse impacts to visual quality as viewed from seasonally navigable waterways (e.g., Muskwa River)	Proportion and amount (% and ha) of disturbed area that is visible from navigable watercourses, by biophysical zone.	Limiting factors from other targets in this pre-tenure plan (e.g. Element 1.1 above addressing the River Break Zone and other targets limiting extent of disturbances or requiring restoration) will achieve this objective.	Overview Assessment Site-level Assessment Restoration Plan Operations monitoring record

CRITERION 3 FORESTED WETLANDS

Element 3.1 Maintain Ecological Integrity of Forested Wetlands

The Low Elevation Wetland Biophysical Zone includes the majority of the primarily open wetland complexes located throughout the pre-tenure plan area. Within these wetlands, isolated patches of coniferous/deciduous trees occur. However, there are areas within the Cool and Warm Aspect Forest Biophysical Zone delineation that are a combination of various amounts of forest and open wetlands. For reasons of scale and dispersed nature, these areas were not delineated.

Objective	Indicator	Target	Output
Ecological Integrity of Forested Wetlands.	Proportion and amount of disturbed area (% and ha).	Achieving the Target in Section 3.2 for *Conservation of Species Diversity* will achieve this objective.	Overview Assessment Site-level Assessment Restoration Plan Operations monitoring record

CRITERION 4 FOREST LAND PRODUCTIVITY

Element 4.1 Maintain Forest Land Productivity

The Ministry of Forests presently estimate that 3500 hectares of merchantable timber exist in the southern portion of the Muskwa-West Pre-Tenure Plan area (10,300 hectares are estimated in both the north and south portions of the area). There are no plans to harvest this in the near future, however this timing could change if the oil and gas industry develop access into this area. Maintaining this area of productive forest is important to the forest sector, the province and others. In addition, coordination of access with forest interests will be important in minimizing impacts to forest land productivity.

Objective	Indicator	Target	Output
Minimize adverse impact to pre-development forest land productivity.	Hectares of disturbance to productive forest lands.	Forest lands are restored to simulate pre-development conditions for forest productivity.	Consultation record with the forest industry Operations monitoring record
	Kilometres of access coordinated with forestry industry.	Coordinated development of access with forestry industry where opportunities exist (see Element 3.4 *Non-Energy Benefits*, in Section 3.2).	Restoration plans Records of opportunities for coordination of access and outcomes.

Achieving the Target:

Restoring forest lands to simulate pre-development conditions for forest productivity over time requires re-establishing the tree species that were removed. This should be consistent with the management direction provided in Section 3.2 under Element 1.4, *Ecosystem Restoration*.

6.4 Information Sources

This section identifies information sources from the predictive ecosystem mapping completed for pre-tenure plans, LRMPs and other sources specific to the Muskwa-West area. It also provides guidance to a pre-tenure plan user on how to find data used in this document, such as the zone map layers in digital formats.

Website address for:

- Biogeoclimatic Information http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Trapping Tenures http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Guide Outfitter Tenures http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Biophysical zone map of the MUSKWA-WEST PRE-TENURE PLAN area http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm
- Focal species winter habitat capability http://srmwww.gov.bc.ca/rmd/ecdev/mog/ptp/gisdatasets.htm

7. SULPHUR / 8 MILE PRE-TENURE PLAN AREA

This pre-tenure plan is scheduled to be completed in 2004 (see Figure 1 in Preface).

8. MONITORING AND ADAPTIVE MANAGEMENT

Monitoring is viewed as a key component in the delivery of the results-based management framework used in pre-tenure plans (refer to Figure 3-2). It is also viewed as a shared and collaborative responsibility. Monitoring supports critical feedback loops in the adaptive management framework for implementing and continually improving pre-tenure plan outcomes and in managing for cumulative effects of multiple operations.

Monitoring is to be conducted at both the operational and strategic levels under two broad headings of:

- Implementation Monitoring (covering Projects and Programs); and
- Sustainability and Plan Effectiveness Monitoring.

Certain activities are to be carried out under each heading. The responsibilities for ensuring monitoring is conducted and for acting on the results varies at each level but the linkages between them require ongoing collaboration amongst those involved.

Pre-tenure plans focus on providing management direction to oil and gas proponents, however to achieve the optimization of resource values discussed in Chapter 3 (Figure 3-1), certain actions must be taken by MSRM (such as monitoring provincial revenues derived from oil and gas activities in the M-KMA). MSRM's responsibilities in this are itemized in Section 8.1.

The following sections identify the parties with primary responsibilities for conducting monitoring across the operational to strategic spectrum. Other government agencies, First Nations or parties with an interest in the M-KMA may also wish to contribute to monitoring pre-tenure plans by communicating with the Ministry of Sustainable Resource Management or the Oil and Gas Commission. Any submissions received may be shared with others.

8.1 Implementation Monitoring – Projects and Programs

Implementation monitoring for projects and programs is applied mainly at an operational scale (i.e. site level) to assess the extent to which development activities comply with plan requirements and regulatory authorizations. The project proponent has a responsibility to ensure compliance with the pre-tenure plan and with their permits to undertake activities. The Oil and Gas Commission has a responsibility to ensure compliance with permits and approved development plans.

Implementation monitoring is also used to compile the activities of multiple proponents to enable reporting on the overall implementation of the pre-tenure plan requirements. The Ministry of Sustainable Resource Management has the primary responsibility for monitoring overall pre-tenure plan implementation against expected outcomes and will work with others in assessing this.

8.1.1 Implementation Monitoring (Projects and Programs) – Responsibilities

Oil and Gas Proponents

The "Management Direction" portions of this document sets out clear responsibilities for a gas tenure holder to comply and report during each phase of development activity. In Section 3.1, "General Planning and Management Direction," Objective 5 sets out clear responsibilities to monitor and report on their activities by documenting compliance. This is to be done on an ongoing basis by qualified environmental monitor(s). Indicators and targets established in Section 3.2, Management Direction, specify what must be monitored and the results that must be achieved. On-site monitors will also provide an early warning and contingency response to unforeseen events. Monitors working on behalf of proponents will also document adaptive management approaches used so that others can learn from the experiences.

Monitoring reports are to be submitted to the Oil and Gas Commission at least annually, or more frequently as required by the OGC permitting conditions. As part of these monitoring reports, proponents will provide the following evaluations by qualified environmental monitors:

- Assess the extent to which Indicators are being periodically measured and document changes in Indicators from the baseline case. This documentation should identify planned versus actual changes to baseline indicators.
- Provide recommendations on suitability of indicators for addressing the pre-tenure plan management objectives.

These reports will be made available to the Ministry of Sustainable Resource Management and others identified as having responsibilities in the overall monitoring and resource management system.

Oil and Gas Commission

The OGC also has responsibilities in project and program monitoring as it needs to ensure that the conditions of it's authorizations are being complied with.

The Compliance and Enforcement Branch monitors all phases of oil and gas development including access and lease-site development (Construction and Exploration Section); drilling, abandonment, and reclamation (Drilling and Completions Section); and production (Pipeline and Facilities Section).

Operators are required to report at the start and end of each phase of project development. Periodic operator reporting and OGC monitoring is conducted during the production phase of the project for the life of the well, facility or pipeline.

OGC monitoring focuses on safety and environmental protection. A risk management approach to planning inspections is used by the OGC for all development phases. The main factors for risk assessment are operator compliance history, site environmental sensitivity, and the inherent risk of the activity. A higher environmental sensitivity is attached to all activities in the M-KMA, with a corresponding inspection frequency. Inspectors assess compliance of the operations with regulations, authorization documents, and the operators Development Plan.

Current OGC enforcement tools include warnings, shutdown/shut-in orders, and cancellation of tenure or authorization. In keeping with its one-window delivery objective, the OGC is implementing the capacity for enforcement of non-compliance with other ministry's statutes such as the *Water Act* and *Waste Management Act*.

In addition to the OGC's normal reporting requirements, operators will be required to report on the Management Direction "Indicators" specified in Section 3.2 of this plan as appropriate to their operations. The pre-development or baseline level within the project area will be a component of the operators "Development Plan." Annual monitoring reports will be required of operators to assess changes in "Indicators" relative to baseline and Target levels. These reports will be shared with MSRM.

Compliance with the Targets is considered a strategic pre-tenure plan goal. Operator requirements for compliance with Targets will be refined through effectiveness monitoring and adaptive management (described further in this chapter) until the indicators and targets are field tested as measurable and effective.

The Reservoir Engineering Branch monitors actual production and reservoir characteristics through production data regularly submitted by operators, and other technical reports such as annual reservoir pressure surveys. These records are evaluated against reservoir characteristics to monitor conservation and wise use of the resource. Recognized reservoir characteristics and assigned allowable production rates may be revised based on this monitoring activity.

Royalty payments are collected by the Ministry of Finance based on production records. The OGC monitors production data and works with the Ministry of Finance to maintain the data integrity.

Ministry of Sustainable Resource Management

Ensuring that the pre-tenure plan is being implemented as intended, across any given plan area and across the M-KMA in general, is the responsibility of the Ministry of Sustainable Resource Management. This level of monitoring moves away from the operational level towards a more strategic approach; it is a first and necessary step to undertake strategic monitoring.

MSRM will receive the Project and Program Monitoring reports of industry from the OGC. MSRM will compile these reports into a summary document outlining activities in relation to the overall pre-tenure plan implementation. This should identify the number and type of new activities undertaken in each pre-tenure plan area and allow compilation of the disturbances and impacts as tracked through the indicators. For example, for the *Conservation of Species Diversity* Target, reports of the individual operator on the hectares of disturbance in the focal species habitat capability classes will be rolled up to tally the cumulative disturbance. This information will then be made available on the MSRM website. This compilation is essential to undertaking Sustainability and Plan Effectiveness Monitoring.

In addition, specific items that MSRM will monitor and tally across each pre-tenure plan area are:

- Hectares of new disturbance from geophysical activities conducted under the OGC guidelines (this information will be tallied into accounts for appropriate Targets).
- Hectares of disturbance by biophysical zone (Biophysical zones are seen as a "coarse filter" analysis for monitoring cumulative impacts. Other Targets, such as wildlife habitat are linked to this and are seen as a "fine filter" measurement).
- Hectares of primitive and semi-primitive Recreation Opportunity Spectrum categories.
- Provincial revenue from oil and gas activities carried out in the M-KMA.[24]

8.2 Sustainability and Plan Effectiveness Monitoring

Sustainability and Plan Effectiveness Monitoring is a strategic level activity and as such, the responsibilities for completing it rest with government agencies operating at the strategic level. The Ministry of Sustainable Resource Management has the responsibility for strategic planning and maintaining the effectiveness of those plans. The Ministry also has responsibility for a few specific monitoring tasks that cannot be attributed to specific oil and gas tenure holders. In the M-KMA, the Muskwa-Kechika Advisory Board has a program of monitoring, review and reporting to ensure plans and activities are carried out in a manner consistent with the *M-KMA Act* and they provide advice to government on this in their annual report. Monitoring of cumulative impacts is an evolving science involving MSRM, the OGC, other government agencies and the M-K Advisory Board and the outcomes of this work are expected to be applied to the M-KMA.

The intent of Sustainability and Plan Effectiveness Monitoring is to assess whether the management directions in the pre-tenure plan are having the desired effect in achieving the stated goals and objectives, both for the pre-tenure plan and for the M-KMA overall.

Sustainability and Plan Effectiveness Monitoring measures environmental, social and economic conditions against the outcomes expected of the plan. This allows an assessment of whether management practices lead to conditions that maintain the values and criteria in the results-based management framework. In situations where all development activities are in compliance with requirements, but an undesired impact has occurred or is accumulating on one Objective, then the plan as written needs changing in the manner that it addresses that Objective. A plan amendment will then be required.

A key step in Sustainability and Plan Effectiveness Monitoring is to evaluate the degree to which the indicators and the Implementation Monitoring are able to measure real environmental conditions and trends. There is a need to confirm that the indicators chosen are indeed providing the information needed to measure progress in achieving goals and objectives. Evaluating the indicators is expected to be an iterative task, conducted annually based on activity levels, to ensure the appropriate conditions are being measured and reported.

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[24] The primary indicator will be revenues generated from tenure sales, possibly supported by measures of economic benefits generated by oil and gas exploration and production activities. Production royalties will be monitored as well, but are not considered a direct indicator of plan implementation as the plan cannot predict whether any given well will be successful or accurately measure how much gas could be produced from the M-KMA.

8.2.1 Sustainability and Plan Effectiveness Monitoring – Responsibilities

Ministry of Sustainable Resource Management

The Ministry has a responsibility to ensure pre-tenure plans are achieving their intended strategic goals, as identified through the stated Objectives and Goals in the Plan. MSRM will evaluate the indicators used in a pre-tenure plan to verify if they are providing the needed information and if this information is in sufficient detail for decision-making. This evaluation will be conducted on a regular basis, depending on activity levels. Where modifications to existing indicators, or additional indicators, are shown to be required, then MSRM will develop these through a plan amendment process.

MSRM will assess environmental conditions and trends against plan objectives to determine the level of risk to identified values. A cumulative impact management framework will be employed as required. Where risks are at unacceptable levels, MSRM will re-evaluate the plan and make necessary changes to it through the plan amendment process.

All information compiled by MSRM in these activities will be shared with others involved in Sustainability and Plan Effectiveness Monitoring. A collaborative approach, particularly with respect to managing cumulative impacts, is essential to successful outcomes.

Muskwa-Kechika Advisory Board

The M-K Advisory Board annual report to the Premier and the Public includes a section on Board's role in "Monitoring, Review and Reporting." The M-K Management Plan directs the Board to prepare an annual monitoring report. This report examines whether the M-K Management Plan objectives are being achieved through local strategic plans (such as pre-tenure plans) and operational activities. Strategic monitoring of pre-tenure plans and oil and gas industry activities fits clearly within this role. The Board is also a key contributor to the cumulative impacts management and monitoring framework. The Board also has the ability to monitor and assess the effectiveness of the linkages amongst local strategic plans in the M-KMA.

Oil and Gas Commission

The Oil and Gas Commission will collaborate with MSRM, other ministries and industry in developing a Cumulative Impact Management Framework (CIMF) for oil and gas activities in the M-KMA. This framework would include both project-specific and regional effects assessments. The OGC will also make recommendations for Plan amendments through its Project and Program Monitoring responsibilities.

8.3 Adaptive Management

The adaptive management discussion paper in Appendix D describes adaptive management as a "formal process for continually improving management policies and practices by learning from their outcomes." Adaptive management is a shared responsibility amongst all parties to use innovation, to develop alternatives on standard approaches where appropriate, and to monitor, learn and cooperate in problem solving as key tools in encouraging oil and gas development in the M-KMA in a manner consistent with the intent of the *M-KMA Act*.

The results-based management framework established in this pre-tenure plan sets out measurable management objectives to be achieved. However, the means by which they are achieved are not prescribed. The framework provides for flexibility in achieving the optimization of resource values, originally described in Figure 3-1 as three overlapping circles representing the social, economic and environmental values. This optimization is to be achieved such that any benefit to one value does not come at an unacceptable expense to either one or both of its counterparts.

The adaptive management approach taken in pre-tenure planning builds on all the above themes and will be applied at both the operational and strategic level. It is also applied as a proactive tool during pre-development planning (emphasizing operational aspects) and as a retrospective tool post-development (emphasizing strategic aspects). A critical requirement in making adaptive management successful is the informed collaboration and buy-in from all interests in meeting social, environmental and economic objectives. The following approaches strive to achieve this.

8.3.1 Proactive (forward looking) Adaptive Management Approaches

Section 3.1, General Management and Planning Direction, establishes outputs proponents are required to deliver for well planned activities and consultations. The overarching intent is to ensure: a) broad consultation with First Nations and Stakeholders, b) coordination with other industrial users, and c) proper consideration of the correct range of resource values and uses, prior to finalizing development plans. Open discussions are essential to successfully delivering the required outputs. These discussions should encourage dialogue about environmental response to activities and stimulate creative ideas to assist proponents in delivering the required outcomes of the pre-tenure plan, rather than attempting to find full consensus on a single solution to each proposed activity.

Early in each phase of oil and gas development planning, proponents are strongly encouraged to host meetings to review and discuss development plan options with First Nations, Stakeholders and government agencies. A priority topic for discussion will be the access proposal for gas development and, where there are multiple tenure holders, access coordination must be addressed. The Ministry of Sustainable Resource Management could play a key role in keeping discussions within the bounds of achieving the outputs and targets established in the pre-tenure plan. Such a workshop would be a significant contribution to addressing the planning, consultation and coordination required of a proponent in a pre-tenure plan.

Proponents hosting meetings would be required to document the issues raised and identify the agreements made or approaches used to resolve disputes as part of the consultation outputs. An appropriate range of alternative access options would be considered and this will assist in laying out the justification for the type of access proposed in the Access Management Plan. Where agreements cannot be reached, the consultation report will provide additional information for the OGC to consider when assessing authorizations for activities.

Objective 6 in Section 3.1 addresses *Adaptive Management* and identifies both passive and active methods. One purpose of hosting meetings would be to consider opportunities for applying either the passive "trial and error" adaptive management methods based on professional judgment and the active "rigorous experiment" approaches (described in Appendix D) as appropriate to the proposed development activities.

8.3.2 Retrospective (looking back) Adaptive Management Approaches

In an effort to learn from past actions, MSRM will annually review the monitoring reports on activities conducted under pre-tenure plans to review practices and any passive or active adaptive management approaches used in achieving the objectives and required outcomes of the pre-tenure plan. This review would normally be undertaken in the spring or early summer after the primary winter activity season. The intent of the review would be to assess innovative practices and to ensure that appropriate feedback into the pre-tenure plan monitoring and amendment process leads to ongoing improvements of the pre-tenure plan.

First Nations and stakeholders will be invited to submit their views on practices and outcomes of activities conducted during the previous year. In some cases, MSRM may decide to host a workshop to review issues in greater detail and to assist in developing recommendations for plan amendments. First Nations, stakeholders, industry and government agencies will be invited to such a workshop.

8.3.3 Outcomes of Adaptive Management

Adaptive management is driven by the challenges faced in planning for gas development in complex natural environments. It is dynamic as it allows us to respond to periodic changes in social or environmental values or to new information from scientific studies, technology or gas resource discoveries. Adaptive management, by its nature, recognizes this complexity, seeks innovative solutions and recognizes that some actions will result in less than ideal outcomes. Overall it capitalizes on learning from successes and mistakes in order to improve the overall system.

In pursuing adaptive management the following outcomes will be achieved over time:

- Continual improvement of pre-tenure plans.
- Improved development plans.
- Informed collaboration amongst all parties.
- Increased creativity and problem solving in addressing management direction issues.
- Greater clarity in establishing a common purpose of pre-tenure plans in the M-KMA.
- Early detection of cumulative, long term and large-scale effects of management approaches in pre-tenure plans.
- Improved understanding of environmental responses to activities.

The Ministry of Sustainable Resource Management will assess the use of adaptive management in gas development activities in the M-KMA as part of the annual strategic monitoring review conducted by the Ministry.

9. PLAN AMENDMENTS AND VARIANCES

Pre-tenure plans are established through a strategic planning process but they translate strategic concerns into operational management directions. These strategic and operational levels of responsibility are incorporated into the responsibilities for amending or varying the contents of a pre-tenure plan.

The results-based management system in this pre-tenure plan establishes objectives that must be met by the proponents of gas developments. The objectives are broad statements describing an ideal future state or condition for a range of important values. Objectives are rooted in the fundamental characteristics (the criteria and elements) of the sustainable management framework and are strategic in nature. Similarly indicators have been carefully selected to represent a much larger set of conditions or values as a means of measuring progress towards achieving an objective.

Targets describe the desired future state or condition of values and are much more operational in nature. The targets represent the socially acceptable, economically feasible and environmentally sustainable conditions within which the outcomes of operational activities are required to occur.

The results-based approach includes a monitoring and adaptive management system that provides constructive feedback to determine if objectives are being achieved. This strategic feedback loop leads to plan amendments. The results-based approach provides sufficient operational flexibility that variances to the targets are expected to be an exceptional event rather than a common occurrence.

9.1 Plan Amendments

The strategic pieces of this pre-tenure plan have been written to encourage gas development activities in a manner consistent with the intent of the *M-KMA Act*. Ongoing monitoring systems built into the plan are designed to ensure this happens. Where the partners involved in pre-tenure plan monitoring demonstrate that a change is needed to these strategic pieces of the plan to maintain consistency with the *M-KMA Act* or other legal obligations, MSRM will undertake a process to review the information and make the appropriate changes. The key strategic pieces that should only be changed through an amendment process are the criteria, elements, objectives and indicators. The annual planning cycle in the monitoring system, and the adaptive management approaches linked to it, ensure an early warning if the pre-tenure plan is not achieving the overall goals. MSRM will be open to receiving justified proposals for plan amendments from other parties.

It is anticipated that recommendations for plan amendments will largely be identified through the regular monitoring process. Plan amendments are generally significant because the plan must be considered a complex inter-connected set of conditions and changes to one part of the plan can affect other parts of the plan. As such, a systematic and rational process for amending the plan is preferred over "one-off" recommendations from individual stakeholders. Where there is general agreement from a range of stakeholders and government agencies that there is a serious problem with part of the plan, MSRM will take this as a serious indication of a need to act on an amendment process.

MSRM will assess proposals for plan amendments and in consultation with other government agencies, First Nations and/or stakeholders, may revise the proposals to achieve the desired results. The degree of consultation will be consistent with the magnitude/significance of the amendment proposed. When a pre-tenure plan is amended, the amended version will be maintained on MSRM's website and oil and gas tenure holders in an area affected by an amendment will be notified.

9.2 Plan Variances

Variances are expected to be uncommon events in the results-based structure of the pre-tenure plan. A variance is a one of a kind event, where a proponent seeks to vary a specific part of the plan to accommodate the unique circumstances of the proposal at hand. The site-specific nature of a variance request makes this an operational level issue. Only the Targets established in the Management Directions are operational and therefore variances can only be proposed to the Targets in the results-based management framework.

Where circumstances unforeseen by this plan lead to a request for varying a Target, the Oil and Gas Commission will assess the operational issues leading to the variance and will consult with MSRM on the proposal. The OGC will determine whether to approve the variance or not, within the context of maintaining the overall optimization of social, environmental and economic values, i.e. within the flexibility identified in Figure 3-1 that was summed up as "any benefit to one value does not come at an unacceptable expense to either one or both of its counterparts." The OGC will provide a justification for their response to any request for a variance.

As part of the annual implementation monitoring, MSRM will review with the OGC any variance decisions made to ensure the overall intent of the pre-tenure plan and the M-KMA are being delivered.

APPENDIX A: GLOSSARY

ACCESS: A ways or means of approach (including heliportable methods, paths, trails, routes, corridors, roads, etc.) to a specified interest. The following apply to surface access:

Primary Access: Routes used to access major river valleys in the plan area, and possibly maintained for more than one season or for more than one year. Access may be used by multiple industrial users.

Secondary Access: Routes that originate off primary access routes, and possibly maintained for more than one season or for more than one year. Access may be used by multiple industrial users.

ACCESS CONTROL MEASURES: Legislated and/or physical barriers to prevent both mechanized and non-mechanized access into a particular geographic area for various reasons including protection of wildlife and wildlife habitat; prevent resource road deterioration; retain the wilderness experience; and public safety.

ATV: All-terrain-vehicle or "ATV" means a wheeled or tracked vehicle propelled by motorized power, and capable of travel on or off a highway, including a motorcycle but not including:

(a) a snowmobile, or
(b) a motor vehicle that is licensed for highway travel under the *Motor Vehicle Act*.

AVOID: to keep away from or withdraw from.

BEST MANAGEMENT PRACTICES: accepted industrial methods for minimizing impacts to the environment, including wildlife populations, wildlife habitat, air, water, and vegetation, to comply with designated objectives and strategies.

CONSERVATION AREA DESIGN: a scoping exercise to delineate and describe a network of core areas and ecological corridors within the M-KMA.

CRITERION: a fundamental standard against which a sustainable management framework can be assessed. In the context of pre-tenure planning, a criterion represents a strategic resource value of the M-KMA.

DEVELOPMENT PLANS: after completion of a successful well and/or the discovery of a designated oil or gas pool, plans for identifying the location of additional wells required to delineate the oil and gas pool, together with location of infrastructure required to produce the well(s), such as gathering or transmission pipelines, roads, batteries, conditioning equipment and processing facilities.

DIRECTIONAL DRILLING
Oil and Gas Wells: due to surface constraints and/or subsurface geological conditions, wells are drilled vertically to a predetermined depth then are gradually curved to penetrate the reservoir at one or several different points. Direction and depth of the well bore is controlled from the surface. If required, a horizontal direction in the substrata can be achieved. There are technical limitations to the feasibility or extent to which this technique can be used.

Oil and Gas Pipelines: a trenchless technology whereby a hole is bored (using specialized equipment - size and complexity dependent on diameter of bore and desired length of hole) from a surface location to the subsurface and subsequently back to the surface. Bore hole diameter and distance achieved are dependent on subsurface geological conditions. Technology used in areas of environmental sensitivity (e.g., watercourses, critical wildlife habitat) and to address visual quality concerns but still allows for the installation of pipelines and/or utility conduits. There are technical limitations to the feasibility or extent to which this technique can be used.

ECOSYSTEM: a functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size (a log, pond, field, forest, or the earth's biosphere) but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem, old-growth ecosystem, or range ecosystem.

ELEMENT: A key constituent of the criterion. Elements represent major features of the criterion with which they are associated; they define the scope of a given criterion.

ENVIRONMENTAL MONITOR: a qualified individual who is onsite during industrial activities to ensure compliance with contractual and legislative requirements relating to environmental protection and may recommend strategies to mitigate adverse environmental impacts.

EVALUATE: to determine the significance or worth of by careful appraisal and study.

EXPLORATORY DEVELOPMENT: this phase includes both on-the-ground geophysical activities and the location and drilling of exploratory wells as defined by the *Petroleum and Natural Gas Act*, Drilling and Production Regulation. Generally, classification as an exploratory outpost well occurs when it is located at a distance which is greater than one spacing area and less than 7 kilometres from a designated oil or gas pool. Exploratory wildcat wells are those located not nearer than 7 kilometres to a designated oil or gas pool.

FOREST PRACTICES CODE: the legislation, regulations and guidebooks that govern forest practices and planning, with a focus on ensuring management of all forest values.

FOREST LAND BASE: all Crown land supporting productive forest types including areas in tree farm licence land, provincial parks, ecological reserves and federal parks. This land base supports the biodiversity elements identified for landscape unit planning.

GEOPHYSICAL ACTIVITY: investigation of the subsurface by seismic, gravimetric, magnetic, electric and geochemical operations, and by any other method approved by the OGC, to develop a geophysical "picture" of the underground rock formations. For example, in a seismic operation, sensitive receivers, called geophones, are placed on the ground to record sound waves reflected back from rock layers after controlled explosions or mechanical vibrations area created on the surface.

GROUND DISTURBANCE: compaction and/or movement of soil, surficial materials or bedrock.

HABITAT CAPABILITY: the ability of a habitat in its optimal condition to provide the life requisites of wildlife species.

HABITAT ELEMENTS: include slope, aspect, structural stage, vegetation site series, soil moisture and nutrient regimes, as reflected in the Predictive Ecosystem Mapping polygons. These polygons were aggregated into three capability classes that represent high, moderate and low capability ecosystems.

HORIZONTAL BORE:
Oil and Gas Wells: well makes a right angle turn to reach a larger portion of the producing formation. There are technical limitations to the feasibility or extent to which this technique can be used.

Oil and Gas Pipelines: trenchless technology whereby a hole is bored horizontally from a pit excavated on one side of a stream to another pit excavated on the other side of the stream to allow the installation of a pipeline or other utility conduits. This method is usually used for short distances and there are technical limitations to the feasibility or extent to which this technique can be used.

INDICATOR: A variable that measures or describes the state or condition of a value. Indicators identify local-level, measurable factors to assess the state of the resource values and the effectiveness of management practices. Indicators enable measurement of progress towards achieving an objective over time. An indicator is selected to represent a larger set of conditions or values.

FOCAL SPECIES: a selected suite of species that is useful in quantifying or evaluating the effect of a disturbance and used to monitor the condition of an abiotic (non-living) or biotic (living) resource.

INDUSTRIAL MOTORIZED ACCESS: Right or means of approach for routes identified for industrial use equipped with a motor or motor vehicle. May include the following modes of transport: two- or four-wheeled drive cars, trucks, and all-terrain-vehicles, snowmobiles and motor driven boats and aircraft.

LANDSCAPE LEVEL: a watershed, or series of interacting watersheds or other natural biophysical (ecological) units, within the larger Land and Resource Management Planning areas.

LEAST RISK WINDOW:
Aquatic: periods of time when work in and about a stream can be conducted with reduced risk to fish and when there are no known fish eggs or alevins (pre-emergent fry) present in the substrate of watercourses scheduled for work.

Terrestrial: periods of time when industrial activities on certain areas of the landbase can be conducted with reduced risk to wildlife populations. At different times of the year, identified topographic areas are vitally important to various wildlife populations and sensitive to disturbance by industrial activities (e.g., ungulate calving and rearing areas, critical winter ungulate habitat areas).

MINIMIZE: to reduce to a minimum

MITIGATE: to make seem less serious or severe.

NATIVE SPECIES: grown, produced, or originating in the locality.

NON-NATIVE SPECIES: not born, growing or originating in the locality, but imported from elsewhere.

NOXIOUS WEEDS: any weed so designated by the Weed Control Regulations and identified on a regional district noxious weed control list.

OBJECTIVE: a broad statement describing an ideal future state or condition for a value.

OPTIMIZE: To make as perfect, effective or functional as possible.

PHYSIOGRAPHY: the physical features of the earth's surface.

PRACTICABLE: capable of being done, effected or put into practice with available means; feasible. Synonyms: workable, possible, viable.

PRE-TENURE PLAN: is a "local strategic plan" under the *Muskwa-Kechika Management Area Act.* A pre-tenure plan is a pre-requisite to an operational instrument affecting or respecting oil or gas resource management (not including the conduct of geophysical activities).

PROCESSING PLANT: means a plant for the extraction from gas of hydrogen sulfide, carbon dioxide, helium ethane, natural gas liquids or other substances but does not include a production facility.

PRODUCTION FACILITY: means a battery, oil treater, pumping station, compressor station, dehydrator, gas injection station, line heater, water disposal facility, water injection station or, on designation of an authorized commission employee, any other system of vessels and equipment designed to accommodate production or disposal, or both production and disposal, of well effluent products and byproducts, but does not include a gas processing plant.

RECREATION OPPORTUNITY SPECTRUM: mix of outdoor settings based on remoteness, area size, and evidence of humans, which allows for a variety of recreation activities and experiences. The descriptions used to classify the settings are on a continuum and are described as: rural, roaded resource, semi-primitive motorized, semi-primitive non- motorized, and primitive. See Appendix F for a description of these classes.

RED AND BLUE LISTED SPECIES: red list includes species than have been legally designated as endangered or threatened under the provincial *Wildlife Act*, are extirpated, or are candidates for such designation. The blue list includes species not immediately threatened, but of concern because of characteristics that make them particularly sensitive to human activities or natural events.

REMOTE OPERATION AND MONITORING: only possible on producing wells as they are being monitored for pressure and flow. A shut in well needs to be checked once a year or once every 3 years (depending on what method was used to shut it in). This may be done using unroaded methods.

RESULTS-BASED: a management strategy focusing on performance and achievement of outputs, outcomes and impacts.

SCENIC AREAS: any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by the district manager.

SERAL STAGE: the stages of ecological succession of a plant community, for example, from young stage to old stage; the characteristic sequence of biotic communities that successively occupy and replace each other, altering in the process some components of the physical environment over time.

SITE SERIES: all sites *within* a biogeoclimatic subzone or variant that are capable of producing the same mature or climax vegetation unit (plant association). Site series are described in the Regional Field Guides to Site Identification. Site and soil conditions, and the vegetation community, are used to identify site series.

STAND AVOIDANCE: the practice of minimizing the cutting of trees and/or other vegetation when locating an access route, pipeline right-of-way, seismic line or lease location by either altering line of sight for linear developments or adjusting the lease location to the degree possible.

STRUCTURAL STAGE: describes the existing dominant stand appearance and structural features emphasized over age criteria (RIC standard).

TARGET: a specific statement describing a desired future state or conditions of an indicator. Targets are intended to be clearly defined, time-limited and quantifiable.

TOPSOIL: the litter, fermented humus (LFH) layer, A and B horizons.

VISUALLY SENSTIVE AREAS: viewsheds that are visible from communities, public use areas, and travel corridors, including roadways and waterways, and any other viewpoint so identified through referral or planning processes.

WILDLIFE HABITAT AREA: is a formal designation under the Identified Wildlife Management Strategy of the *Forest Practices Code of British Columbia Act* to meet the habitat requirements of one or more species of identified wildlife.

APPENDIX B: GUIDELINES – PLANNING AND MANAGEMENT METHODS

The following table identifies guidelines for delivering the outputs listed for some of the Elements in Section 3-1. These guidelines are not requirements on tenure holders in carrying out oil and gas activities. They contain more detailed and prescriptive management approaches, offered as options on achieving the results intended in the main text of the pre-tenure plans; other options for achieving the results will also be available. The guidelines were drawn from Public and First Nation discussions during this planning process and the earlier Besa-Prophet Pre-Tenure Plan Phase I process.

Elements	Suggested Guidelines
Output 1.1 Overview Assessment and Preliminary Development Plan	• refer to the discussion on "Overview Assessments" following this table.
Output 1.3 Development Plans, including Site-Specific Assessments and Restoration Plans	• refer to the discussion on "Development Plan," including sections addressing Impact Assessments, following this table.
Output 1.4 Access Management Plans	• Plan for winter season access [illegible] minimize overall impacts of road construction. • Evaluate the use of low-impact vehicles to reduce overall environmental impacts (e.g. lower ground pressure vehicles). Exploration Access: multi-season • Where multi-season access is proposed for exploration purposes, provide a rationale that demonstrates that a winter road using best practices is not sufficient to provide the needed access. The rationale should address the following information: o technical factors (e.g. technical factors include uncertainties of stratigraphy, potential for sour well characteristics, drilling time required); o safety factors; o economic factors; o type of multi-season access; o topographic constraints limiting winter access options; o scope and permanence of additional impacts from access outside of the winter season.

Elements	Suggested Guidelines
Output 1.4 Access Management Plans (continued)	Production Access: multi-season • Where all season access is proposed for production and/or pipeline development, provide a rationale that demonstrates that a winter road using best practices is not sufficient to provide the needed access. The rationale should address the following information: o technical factors (e.g., servicing requirements, fluid handling); o safety factors; o economic factors; o type of multi-season access; o topographic constraints limiting winter access; o scope and permanence of additional impacts from access outside of the winter season.

Overview Assessment and Preliminary Development Plan

This assessment is intended to assist the proponent to responsibly plan a drilling and development program. Information is expected to be gathered from existing sources; gaps in needed information are expected to be filled through site-specific assessments, including field studies. The study area for the assessment should be the petroleum tenure boundary, potential access corridors from the boundary of the M-KMA, and if necessary, portions of neighbouring lands that may be impacted by developments.

The overview assessment and preliminary development plan should describe:

- The overall project proposal;
- How information was gathered and key references;
- The biophysical setting including the significance of:
  - climate
  - physiography and geology
  - bedrock and surficial geology (including soils and earth processes)
  - hydrology (including water quality)
  - vegetation (including known plant species with special conservation status)
  - aquatic ecosystems (including known populations or inventories of fish or benthic invertebrates)
  - wildlife (including high sensitivity zones, species with special conservation status, wildlife movement corridors, mineral licks, wildlife dens, raptor nests, critical wintering and core wildlife areas and lambing and rutting areas);

- Other land uses (such as hunting, guide outfitting, fishing, commercial back country recreations, trapping, etc.) and any specific direction from Fort Nelson or Fort St. John LRMPs;
- Information on First Nations' areas of traditional practices, heritage and cultural resources; and
- General recommendations that would facilitate environmentally sensitive planning and development in the petroleum tenure area.

Development Plan

A development plan is to be submitted to the OGC prior to any required permits being approved. While recognizing the issues of confidentiality and competitive requirements, tenure holders should meet with OGC staff when preparing a development plan to identify opportunities for coordinating access and pipeline use with other industrial users. Other industrial tenure holders known to be working in the area or with plans to work in the area should also be contacted. Actions may involve coordinating efforts and resources or assessing common use of roads, pipeline and utility right of ways and general infrastructure.

More detailed impacts assessments are expected for areas of surface disturbance. These assessments can initially be guided by information from the overview assessment and should lead to site-specific assessments such as described below. In addition, impact assessment(s) are expected to provide a broader evaluation of access route and impact mitigation options. Plans for deactivation and restoration of all roads and trails at the end of each permitted phase of development should be incorporated in the development plan.

Applications for well licenses and other surface disturbances such as pipelines and facilities will be submitted as part of the development plan, as well as project scenarios and development infrastructure options.

Development plans will be amended and resubmitted, as additional information becomes available through exploratory and testing activities and as an overall project matures.

Impact Assessment (includes site specific assessments)

An impact assessment should contain the level of detail required to evaluate the impacts of a proposed activity or development on sensitive resource values. It may be necessary to conduct environmental baseline analyses to determine what specific sensitivities exist and to define appropriate locations for development and mitigation measures.

The level of detail expected in any habitat impact assessment will vary with project stage, the ultimate scope of development, the relative sensitivity of the proposed development area, and the extent of other existing and potential developments (both energy and non-energy related) in the area. The detail must be sufficient to allow examination of the impact of the proposed development on the environment.

A habitat impact assessment should include:

- Introduction.
- Methods.

- Project consultation.
- Analysis of site and access selection:
    - Well site alternatives,
    - Access alternatives.
- Project infrastructure:
    - Construction and drilling camp,
    - Remote sump,
    - Borrow pit.
- Baseline environmental conditions:
    - Terrestrial environment including current status, habitat use and behavior of wildlife, critical wintering habitat, critical lambing, calving and rutting grounds, wetlands and riparian areas,
    - Fish and aquatic ecosystems.
- Descriptions of management directions from approved strategic and local plans for other resource values and activities such as hunting, fishing, recreation use, trapping, etc.
- Specific resource impact assessments (such as visual impact assessment, archaeological impact assessment, or other) as required.
- A description of potential for impact to resources of concern.
- Measures to coordinate activities, in time and location, which could reduce impacts on other users of the area.
- Measures to coordinate access and development activities with other industrial users to reduce overall impacts.
- Measures to mitigate identified impacts.
- Plans for monitoring and reporting on activities.
- Restoration plans.

The following is a description of suggested methodologies and content for resource specific assessments that may be necessary.

Visual Impact Assessment

Visual impact assessments should be fully informed by any Visual Quality Objective identified in a strategic plan for the area (such as the LRMPs) or the Visual Landscape Inventory information available regarding existing visual conditions. The purpose is to assess the impact of proposed activity or development on visual and scenic resources within and adjacent to the site and access route locations.

The Visual Impact Assessment will provide information that can be used to refine the size, shape and position of the development site on the landscape.

The basic procedures for conducting a Visual Impact Assessment include:

- Planning and pre-field trip preparation (gather all known information, identify locations the proposed site will be visible from, transfer known visual sensitivity information onto maps, along with any existing landscape alterations).

- Fieldwork – conduct assessment using means and route of travel most often used by visitor; select viewpoint(s) that provides best view of proposed operations; create a photographic record of areas being assessed.
- Develop Options – create one or more development or activity options exhibiting elements of good visual design; use an appropriate method to prepare a visual simulation of each option (the simulation will demonstrate what the proposed development or activity will look like from the viewpoint(s)).
- Assess the simulations to ensure proposed activity will achieve the desired visual quality result (as described in the pre-tenure plan) over time.

More detailed information regarding Visual Impact Assessments can be found in *Forest Practices Code Visual Impact Assessment Guidebook*, Second edition January 2001 (found at: http://www.for.gov.bc.ca/TASB/LEGSREGS/FPC/FPCGUIDE/visual/httoc.htm)

Archaeological Impact Assessment

An archaeological impact assessment should be undertaken when the proposed development will disturb or alter the landscape and potentially endanger archaeological sites.

The archaeological impact assessment process is comprised of two principal components: archaeological resources assessment and impact management. The assessment is primarily concerned with the location and evaluation of archaeological resources, and the assessment of impacts during the initial stages of project planning. Impact management follows directly from assessment and is primarily concerned with managing unavoidable adverse impacts as well as unanticipated impacts.

The assessment may require an inventory study involving a program of field identification and recording of any archaeological resources within a proposed development area. The nature and scope of the study will be defined primarily by information gathered from local First Nations and known archaeological sites. Where archaeological resources are present, an impact assessment may be necessary to determine the nature and extent of the impacts expected.

The impact assessment should lead to recommendations for managing activities and the archaeological resource in light of the identified impacts. Management options may include: alteration of proposed development plans to avoid resource impact, or mitigative studies directed at retrieving resource values prior to impact.

Terrain Stability

Site-specific assessments of terrain stability may be required to provide a careful evaluation of the landslide and erosion hazards and risks in any proposed development; there may be multiple sites in a development plan that require terrain stability assessments. Assessment procedures may include:

- Detailed terrain stability mapping to provide a comprehensive assessment of terrain stability hazards. Creating these maps will help to more narrowly define where terrain stability field assessments are required to supplement existing information.
- Terrain stability field assessments that focus on specific areas of concern for a proposed lease, road or pipeline location.

More detailed information and procedures for completing both detailed terrain stability maps and terrain stability field assessments can be found in the *Forest Practices Code Mapping and Assessing Terrain Stability Guidebook – 1999* on the following website:
(http://www.for.gov.bc.ca/TASB/LEGSREGS/FPC/FPCGUIDE/terrain/index.htm)

Vegetation Assessment

A vegetation assessment should be conducted where vegetation is particularly sensitive to development (such as a wetland zone) or has very slow recovery times (such as alpine plateau). This study identifies the quantity and quality of various vegetation types, supported by photographic records. The information will lead to recommendations on locating development activities and on restoring disturbances.

Vegetation assessments use:

- Photo interpretation.
- Ground-sample measurements from transects at sites where surface disturbance is proposed.

APPENDIX C: GUIDELINES – MANAGEMENT OBJECTIVES

The following table identifies guidelines for achieving the Objectives and Targets listed for some of the Elements in Section 3-2. These guidelines are not requirements on tenure holders in carrying out oil and gas activities. They contain more detailed and prescriptive management approaches, offered as options on achieving the results intended in the main text of the pre-tenure plans; other options for achieving the results will also be available. The guidelines were drawn from Public and First Nation discussions during this planning process and the earlier Besa-Prophet Pre-Tenure Plan Phase I process.

Elements	Suggested Guidelines
Element 1.1 Conservation of Ecosystem Diversity	• Use biophysical zone maps available from MSRM to overlay with proposed development plans and with monitoring reports, to calculate disturbances to each zone. (websites supplied in pre-tenure plan document)
Element 1.2 Conservation of Species Diversity	Non-Indigenous Plants • Conduct inventory, control and monitoring of all regionally significant noxious weeds and invasive non-indigenous plant species. • Avoid the spread of noxious weeds and invasive non-indigenous plant materials at all times by keeping all equipment and vehicles used in oil and gas activities clean (e.g., steam clean vehicles/construction equipment/tracked equipment/etc. prior to entering the plan area.) Wildlife: General • Locate development away from sensitive habitats, alpine meadows and wetlands, or wildlife features such as licks, wallows, dens and nests, unless developments in these areas lead to less overall environmental impact. Buffer widths around wildlife features will vary according to wildlife species sensitivity, topography and vegetative cover. • During den use, minimize disturbance associated with oil and gas activity, particularly construction activities, in the vicinity of the den, to the extent practicable. Timing of den use will vary by wildlife species. • Protect wildlife from accessing sumps by fencing these sites prior to their restoration. • Avoid placing developments in high quality habitat and maintain adequate terrain separation to prevent disturbance to wildlife as identified in provincial guidelines.

Elements	Suggested Guidelines
Element 1.2 Conservation of Species Diversity (continued)	• Avoid traversing animal approach corridor(s) to a wildlife feature, where practicable. • Construct frequent escape breaks in bermed snow along roadways when snow plowing is required to allow animals to exit the roadway. • To the extent practicable, observe the following buffers around raptor nest sites: o Prevent industrial development within 100 m of nest trees. o Minimize human activity within 100 m of active nests between February and July. o Maintain all existing habitat components within 100 m of nest trees. o For Northern Goshawk, prevent industrial development within a 240 ha post-fledging area centred on known nest trees. Wildlife: Aircraft Use • Flight paths are not to follow contours and/or landscape features. • Select aircraft types that produce less noise impact. • To protect sensitive wildlife from inadvertent impacts of aircraft overflights, the following protocols[25] apply for aircraft activity unless environmental overview assessments or development planning provides more specific information on wildlife use areas:[26] o Mountain Goat: Maintain seasonal no-fly zones for helicopters and fixed-wing aircraft that are a minimum 2000 m horizontal and vertical distance from mountain goat habitats in steep slope warm aspect zones year round and steep slope cool aspect zones in summer, unless goats are separated by a physical barrier that would minimize disturbance levels (e.g., mountain ridges or terrain block).

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[25] Harper, W.L., J.M. Cooper et al. 2001. *Guidelines for Evaluating, Avoiding and Mitigating Impacts of Major Development Projects on Wildlife in British Columbia (Draft).* OSIRIS Consulting for the BC Ministry of Environment, Victoria, BC.

[26] Digital coverage delineating species habitat available from Ministry Water, Land and Air Protection, Fort St. John, upon request http://wlapwww.gov.bc.ca:8000/dr_pub_prod/owa/drwp_homepage.display

Elements	Suggested Guidelines
Element 1.2 Conservation of Species Diversity (continued)	o Thinhorn Sheep: Limit helicopter and fixed-wing flight altitudes to a minimum 500 m over mountain sheep habitat in steep slope warm aspect zones year round and steep slope cool aspect zones in summer, and a minimum 1000 m horizontal distance from sheep habitat in steep slope warm aspect zones year round and steep slope cool aspect zones in summer. For highly sensitive sites (e.g., natal areas) maintain a 2000 m separation from helicopters and fixed-wing flights. o Caribou: Limit helicopter and fixed-wing flight altitudes to a minimum of 300 m over caribou habitats in high elevation plateau zones in winter Wildlife: Camps and Workers • Establish specifications for garbage, food handling and disposal to prevent wildlife attraction. • Oil and gas workers are not accompanied by dogs, other pets and domestic livestock while accessing the plan area for industrial purposes. Horse transportation for industrial purposes is permitted. • Minimize the need for relocating or destroying bears due to human encounters through a bear emergency plan and a bear reporting and monitoring plan. • Train oil and gas workers on responsible behaviour near grizzly and black bears. Fish: • Build all new or reconstructed crossings of fish bearing streams so that natural patterns and timing of fish passage are assured for fish species and their respective life stages. • Use identified **least-risk work windows**[27] to conduct work in and about a stream to reduce risk to fish where the following species are present or likely to be present: o Spring spawners (e.g., Arctic Grayling, Rainbow Trout) - July 15 - March 31 o Fall spawners (e.g., Bull Trout, Mountain Whitefish) – June 15 - August 31 o Both spring and fall spawners - July 15 - August 15 o Work outside these windows only when the work results in reduced overall environmental impact.

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[27] Source: BC Ministry of Forests. 2002. *Fish-Stream Crossing Guidebook.* Forest Practices Branch, Ministry of Forests, Victoria. Forest Practices Code of BC Guidebook.

Elements	Suggested Guidelines
Element 1.4 Ecosystem Restoration	• Restore slopes to a natural gradient and replace coarse woody debris to mimic natural surface topography, and re-contour cuts to blend into surrounding landscapes. • Return fill material that is not needed for long-term restoration to the original borrow pit. • Dry sumps and backfill; monitor and correct for subsidence, ultimately restoring soil layers. • Mound sumps above the original soil level. Monitor and correct for subsidence. • Replanted tree and shrub species will be from appropriate ecotype. Planting stock will conform to the seedling transfer guidelines as outlined in the Forest Practices Code's (FPC) "Seed and Vegetation Materials Guidebook." • Monitor stocking success to ensure re-vegetation comparable to undisturbed adjacent areas and for tree species, as described in the stocking guidelines contained in the FPC "Establishment to Free to Grow Guidebook, Prince George Region." • De-compact soils in disturbed areas and incorporate mulch to assist in revegetation.
Element 2.1 Conservation of Soil Resources	• Locate development away from shallow soils, permafrost, steep slopes, unstable slopes, landslides, alpine meadows and areas of high water tables, unless developments in these areas lead to less overall environmental impact. • Prevent erosion and compaction of topsoil by avoiding disturbance of saturated soils. • Minimize topsoil removal or other surface disturbance by using best management practices (such as use of geotextiles, swamp mats, fill to create platforms, etc.) • Where topsoil and natural surface debris is removed, segregate and stockpile for restoration to natural state similar to pre-development conditions. • End-haul fill during road construction when roads requiring cut and fill are used.
Element 2.2 Conservation of Water Resources	• Restore natural slopes, contours and drainage patterns • Locate stream crossings at right angles to water flow. • Build cross ditches, water bars or other erosion control measures to prevent soil erosion and sedimentation.

Elements	Suggested Guidelines
Element 2.2 Conservation of Water Resources (continued)	• Divert surface runoff in a controlled manner away from areas of surface disturbance to avoid erosion. Contain runoff and sediment produced on site. • Use the most benign mud system compatible with the drilling situation and objectives. • Use innovative or best management practices to contain hazardous materials, install leak detection systems and monitor surface and groundwater quality.
Element 3.4 Non-Energy Benefits	• If existing campsites are to be used, avoid impacts on recreational use (e.g. limit use to periods of least recreational use). • Ensure an adequate buffer width is maintained so that sight or noise barriers or screens can be maintained or established between recreational or guide outfitting use sites and oil and gas activities (e.g., industrial camps, access/pipeline routes, lease sites). Width of buffer is dependent on topography and vegetative cover. • During periods of high recreational use of campsites (July 1 to October 15), minimize noise associated with oil and gas activities in the vicinity to the extent practicable. • Where practicable, locate lease sites, roads and pipelines away from grazing areas, traplines, camps, etc. or time activities to avoid conflicts. M-KMA Access Management Area • Prohibit off-site recreational use by industrial workers under an industrial permit. Prohibit use of vehicles by industrial workers for recreational purposes on oil and gas industrial roads. • Access control measures to prohibit new public motorized access will be installed at the boundary of the M-KMA or other critical points on any new access routes. (Public motorized access is allowed where oil/gas roads are built on designated Access Management Area routes).
Element 3.5 Wilderness	Visual Quality • Design above ground facilities to minimize visibility (e.g., screen developments from other users, mimic natural openings and patterns, use non-reflective surfaces, native materials, surface colours and patterns on facilities to blend in with the immediate surroundings).

Elements	Suggested Guidelines
Element 3.5 Wilderness (continued)	• Minimize use and visibility of lighting on equipment to the extent practicable. • Where practicable, locate development away from height of lands (such as ridgelines) unless a need is demonstrated. • Use materials that visually blend with surroundings in construction of bridges, traffic control devices, guard rails, retaining walls and culverts, etc. • remove visual evidence of operations (e.g. signs, infrastructure, waste materials, ribbons, etc.) as soon as possible after use. • Design developments to reduce line of sight distances and feather edges of disturbances to reduce visibility of linear edge effects. Noise • Use natural barriers (e.g. topography, vegetation, etc.) or innovative or best management practices to reduce the effects of noise disturbance.

APPENDIX D: ADAPTIVE MANAGEMENT DISCUSSION PAPER

(Including an Example Project)

INTRODUCTION

Issues surrounding natural resource management are ecologically, socially and economically complex. This complexity, together with limited understanding of natural systems and the unpredictable nature of many natural events and the inherent inability to undertake long-term planning for "hidden" subsurface resources, contributes to uncertainty about outcomes of management decisions. Changing social values and goals further increase uncertainty and contribute to controversy. Faced with these issues, people are asking questions such as: What is the best way of meeting management objectives? Are these objectives consistent with societal goals? How can we adapt management practices and plans to accommodate changes in values and goals?

Increasingly, adaptive management is suggested as a strategy for answering these and other questions. It is an approach to management that explicitly acknowledges uncertainty about the outcomes of management policies, and deals with this uncertainty by treating management activities as opportunities for learning how to manage better.

WHAT IS ADAPTIVE MANAGEMENT?

Adaptive management is a formal process for continually improving management policies and practices by learning from their outcomes. It is a systematic, rigorous approach to "learning by doing." It is a more efficient way of learning than haphazard, "trial-and-error" approaches. While information about what works and what doesn't can be gained through trial and error, the efficacy of this approach is limited in terms of the knowledge gained (e.g., causal relationships). In addition, because adaptive management requires documentation of objectives, assumptions, decisions, and outcomes, it increases the chances that knowledge gained through experience will be passed on to others.

With adaptive management, policies are deliberately designed to increase understanding about the effect of management activities on the systems (including both environmental or economic systems) being managed. Increased understanding about how the system responds can lead to more efficient and effective management, and can allow managers to accommodate changes in social values and goals. Learning is most rapid when management activities are designed as controlled replicated experiments that test alternative hypotheses about the response of the system to management activities. This form of adaptive management is often referred to as "active" adaptive management.

However, where powerful experiments are impossible or impractical, the "passive" form of adaptive management can be used. With passive approaches, managers assume that a single model is correct (based on existing data), implement the policy that this "best" model predicts will have the desired outcome, and then monitor and evaluate actual outcomes.

Regardless of whether active or passive approaches are used, for learning to occur, actual outcomes must be compared to objectives and to predicted outcomes. Feedback loops for using information to modify management must be built into the plan from the outset. Outcomes that are unexpected or that differ from predictions then become opportunities to learn and improve, rather than management "failures."

Adaptive management involves:

- Explicitly recognizing that there is uncertainty about the outcome of management activities;
- Deliberately designing management policies or plans to increase understanding about the systems, and reveal the best way of meeting objectives;
- Carefully implementing the policy or plan;
- Monitoring the outcomes, considering the objectives and predictions and incorporating results into future decisions.

Adaptive management requires managers and decision-makers who are willing to "learn by doing," and who acknowledge that making mistakes is part of learning.

KEY ELEMENTS OF ADAPTIVE MANAGEMENT

Certain interlinked elements are necessary for managing adaptively. These include: defining problem boundaries, identifying key questions, generating alternative hypotheses about systems function, designing rigorous experiments and/or testing "best" alternative management approaches, monitoring, and then using the information to adjust activities and objectives (i.e., "feedback"). Defining measurable management objectives is a critical antecedent to effective adaptive management. Applying these elements with creativity and imagination is integral to dealing effectively with uncertainty and change.

BENEFITS OF ADAPTIVE MANAGEMENT

Proponents argue that we can learn to manage more effectively by designing and implementing management activities so that they: (i) can be evaluated reliably, and (ii) can improve understanding of the relationships that underlie measured responses. Key benefits mentioned in the literature include:

- Well-designed experiments allow managers to evaluate reliably the effectiveness of alternative management actions;
- Adaptive management increases understanding of how natural and economic systems function;
- Adaptive management allows managers to proceed systematically and responsibly in the face of uncertainty, gaps in understanding and disagreement;
- Management experiments may provide the only opportunity for learning about large-scale, ecosystem-level relationships;
- Adaptive management encourages more efficient and effective monitoring;
- Adaptive management helps to define the boundaries between activities that are ecologically sustainable and activities that are not; and
- Adaptive management affords an opportunity to respond to discoveries of previously unknown petroleum resources and to accommodate responsible development of those resources.

CONCLUSION

Adaptive management requires a shift in the way both institutions and individuals operate. We must be willing to acknowledge uncertainty, encourage innovation and value the learning that can come from making mistakes. Developing strategies for overcoming or minimizing these potential obstacles will be crucial to the success of adaptive management. Just as we can learn from mistakes made in managing natural systems, we must strive to learn from the mistakes we will make in implementing adaptive management.

To assist oil and gas proponents in seeing how Adaptive Management can be used to address uncertainty in the context of a pre-tenure plan area, the following hypothetical example of the "active" approach has been developed. The example uses draft objectives, strategies and guidelines discussed during the pre-tenure planning consultation process.

ADAPTIVE MANAGEMENT EXAMPLE
(from the Besa-Prophet Pre-Tenure Plan – BPPTP)

1.0 Background

The general objective or result for **exploratory development** in the BPPTP area is to minimize or mitigate impacts on the area's resource values. One general strategy developed to minimize surface disturbance to soils, vegetation, water quality and natural drainage patterns in the sensitive low elevation wetlands/meadows portion of the Nevis planning unit is to use "low impact, stand avoidance" winter roads for primary and secondary access to lease sites. Road construction options (guidelines) include using snow, wood chips or shale for fill material. Due to uncertainty regarding the relative effectiveness of these different materials in achieving the desired results, the following management experiment is proposed. After results of the experiment have been evaluated, the management strategy for fill material may be adjusted.

2.0 Project Outline

Problem Assessment

Problem Statement

We do not know what type of fill material should be used on "low impact, stand avoidance" winter roads for primary and secondary access roads in the exploratory development phase of oil/gas activities in the BPPTP area.

Scope

The project will take place in the low elevation wetlands/meadows portion of the Nevis planning unit during the winter use season.

Management Objective

The primary objective is to minimize or mitigate impacts on the plan area's resource values.

Management Strategy

One means of achieving the management objective is to minimize surface disturbance to soils, vegetation, water quality and natural drainage patterns in the plan area.

Management Guideline

Preferred types of fill material include snow, wood chips or shale.

Key Uncertainty

The key uncertainty is the relative effectiveness of the three different types of fill material in achieving the management objective and strategy.

Study Hypotheses

Ho: There is no difference between snow, wood chips and shale fill on study variables.

Ha: There is a difference between snow, wood chips and shale fill on study variables.

Project Design

Study Location

The study will be conducted between kms 0 to 6 along the access route to Big Rigs exploratory lease site C-51-J, 94G6 in the Nevis planning unit.

Study Variables/Indicators

Variables	Indicators
1. Soil compaction levels conductivity	Bulk density, aeration porosity, water
Vegetation:	
2. Species diversity	Simpson's Index
3. Intro of non-native species	Presence/type
Water:	
4. Changes in water quality	Biological oxygen demand
5. Changes in nat. drainage patterns	Amount/duration of flooding/ponding

Treatments/Management Actions

Ensure sites for controls and treatments have similar topography, soil and water characteristics and plant communities.

Control: No fill

Treatment A: Snow fill

Treatment B: Wood chip fill

Treatment C: Shale fill

Forecasted Outcomes on Study Variables

Variable 1 (soil compaction levels): Treatment C > Treatment B > Treatment A

Variable 2 (species diversity): Treatment A> Treatment B> Treatment C

Variable 3 (intro of non-native species): Treatment C> Treatment B > Treatment A

Variable 4 (changes in water quality): Treatment B>Treatment C>Treatment A

Variable 5 (changes in nat. drainage patterns): Treatment C>Treatment B> Treatment A

Experimental Design

To be determined

Monitoring Design

Pre-treatment baseline monitoring of indicators before freeze-up conditions.

Post-treatment monitoring of indicators after spring thaw.

Implementation

Qualified third-party consultant chosen through a Request For Proposal will conduct implementation of the project.

Evaluation

Appropriate statistical analysis will be used to analyze data, test hypotheses and forecasted outcomes.

Adjustment

Project results/interpretation will be used to revise the management strategy

Logistics

Project Participants

MSRM, OGC, First Nations and stakeholders (compare with Section 8.3.1 Proactive Adaptive Management Approaches)

Big Rigs (Exploratory Proponent)

Implementation consultant

Budget

Funding partners/levels to be determined

APPENDIX E: RED AND BLUE LISTED PLANTS AND VERTEBRATES

*Information source: http://srmwww.gov.bc.ca/atrisk/toolintro.html

Information on British Columbia (BC) species that have a conversation risk have been identified via the Conservation Data Centre (CDC), in the BC Ministry of Sustainable Resource Management. For oil and gas proponents, the following red and blue lists identify those plant and animal species that are particularly sensitive to human activities.

The CDC compiles plant and animal species information by BC Forest District which encompass larger geographic areas than the pre-tenure plan areas. Therefore, not all of the listed species will be found within each of the pre-tenure plan areas. The Halfway Graham pre-tenure plan area is within the FSJ Forest District and the Muskwa-West pre-tenure plan area within the FN Forest District.

RED LIST:
Includes any indigenous species or subspecies that have, or are candidates for Extirpated, Endangered, or Threatened status in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Not all Red-listed taxa will necessarily become formally designated. Placing taxa on these lists flags them as being at risk and requiring investigation.

BLUE LIST:
Includes any indigenous species or subspecies considered to be Vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.

PLANT SPECIES
Fort St John Forest District - Halfway-Graham Pre-Tenure Plan Area

Scientific Name	English Name	BC Status
Alopecurus alpinus	alpine meadow-foxtail	Blue
Anemone canadensis	Canada anemone	Blue
Arnica chamissonis ssp. *incan*	meadow arnica	Blue
Artemisia longifolia	long-leaved mugwort	Red
Artriplex nuttallii	Nuttall's orache	Red
Calamagrostis montanensis	plains reedgrass	Red
Carex bicolor	two-colored sedge	Blue
Carex misandra	short-leaved sedge	Blue
Carex rupestris ssp. *rupestris*	curly sedge	Blue
Carex torreyi	Torrey's sedge	Blue
Carex xerantica	dry-land sedge	Blue
Draba glabella var. *glabella*	smooth draba	Blue

Scientific Name	English Name	BC Status
Draba lactea	milky draba	Blue
Draba porsildii	Porsild's draba	Blue
Epilobium hornemannii ssp. *behringianum*	Hornemann's willowherb	Blue
Epilobium leptocarpum	small-fruited willowherb	Blue
Eriophorum vaginatum ssp. *vaginatum*	sheathed cotton-grass	Blue
Glyceria pulchella	slender mannagrass	Blue
Gymnocarpium jessoense ssp. *parvulum*	Nahanni oak fern	Blue
Helictotrichon hookeri	spike-oat	Blue
Juncus arcticus ssp alaskanus	arctic rush	Blue
Lomatium foeniculaceum var. *foeniculaceum*	fennel-leaved desert-parsley	Red
Lomatogonium rotatum	marsh felwort	Blue
Luzula nivalis	Arctic wood-rush	Blue
Luzula rufescens	rusty wood-rush	Blue
Minuartia austromontana	Rocky Mountain sandwort	Blue
Oxytropis jordalii ssp. *davissii*	Davis' locoweed	Blue
Pedicularis parviflora ssp. *parviflora*	small-flowered lousewort	Blue
Penstemon gracilis	slender penstemon	Red
Polemonium boreala	northern Jacob's-ladder	Blue
Polemonium occidentale ssp. *occidentale*	western Jacob's-ladder	Blue
Polygala senega	Seneca-snakeroot	Red
Polypodium sibiricum	Siberian polypody	Red
Ranunculus pedatifidus ssp. *affinis*	birdfoot buttercup	Blue
Ranunculus rhomboideus	prairie buttercup	Red
Rosa arkansana var. *arkansana*	Arkansas rose	Blue
Rumex paucifolius	alpine sorrel	Blue
Salix petiolaris	meadow willow	Blue
Selaginella rupestris	rock selaginella	Red
Senecio plattensis	plains butterweed	Blue
Silene drummondii var. *drummondii*	Drummond's campion	Blue
Silene taimyrensis	Taimyr campion	Blue
Solidago nemoralis ssp. *longipetiolata*	field goldenrod	Blue

Fort Nelson Forest District - Muskwa West Pre-Tenure Plan Area

Scientific Name	English Name	BC Status
Androsace chamaejasme ssp. *lehmanniana*	sweet flowered fair-candelabra	Blue
Aster puniceus var. *puniceus*	purple-stemmed aster	Red
Astragalus umbellatus	tundra milk-vetch	Blue
Botrychium crenulatum	dainty moonwort	Blue
Braya purpurascens	purple braya	Blue
Carex bicolor	two-colored sedge	Blue
Carex heleonastes	Hudson Bay sedge	Blue

Scientific Name	English Name	BC Status
Carex incurviformis var. *incurviformis*	curved-spiked sedge	Blue
Carex lapponica	lapland sedge	Blue
Carex membranacea	fragile sedge	Blue
Carex misandra	short-leaved sedge	Blue
Carex petricosa	rock-dwelling sedge	Blue
Carex rupestris ssp. *rupestris*	curly sedge	Blue
Carex tenera	tender sedge	Blue
Chamaerhodos erecta ssp. *nuttallii*	American chamaerhodos	Blue
Cicuta virosa	European water-hemlock	Blue
Claytonia tuberosa	tuberous springbeauty	Blue
Draba alpina	alpine draba	Blue
Draba cinerea	gray-leaved draba	Blue
Draba fladnizensis	Austrian draba	Blue
Draba glabella var. *glabella*	smooth draba	Blue
Draba lactea	milky draba	Blue
Draba porsildii	Porsild's draba	Blue
Elymus calderi	Calder's wildrye	Blue
Elymus sibiricus	Siberian wildrye	Blue
Eopilobium davuricum	northern swamp willowherb	Blue
Eopilobium hornemannii ssp. *behringianum*	Hornemann's willowherb	Blue
Eopilobium leptocarpum	small-fruited willowherb	Blue
Eriophorum vaginatum ssp. *vaginatum*	sheathed cotton-grass	Blue
Eutrema edwardsii	Edwards wallflower	Blue
Galium labradoricum	northern bog bedstraw	Blue
Glyceria pulchella	slender mannagrass	Blue
Gymnocarpium jessoense ssp. *parvulum*	Nahanni oak fern	Blue
Impatiens aurella	orange touch-me-not	Blue
Juncus albescens	whitish rush	Blue
Juncus arcticus ssp. *alaskanus*	Arctic rush	Blue
Kobresia sibirica	Siberian kobresia	Blue
Lesquerella arctica var. *arctica*	Arctic bladderpod	Blue
Leucanthemum integrifolium	entire-leaved daisy	Blue
Lomatogonium rotatum	marsh feltwort	Blue
Lupinus kuschei	Yukon lupine	Blue
Luzula confusa	northern wood-rush	Blue
Luzula kjellmaniana	Kjellman's wood-rush	Blue
Luzula nivalis	Arctic wood-rush	Blue
Luzula rufescens	rusty wood-rush	Blue
Malaxis brachypoda	white adder's-mouth orchid	Blue
Minuartia austromontana	Rocky Mountain sandwort	Blue
Minuartia elegans	northern sandwort	Blue
Minuartia stricta	rock sandwort	Blue
Minuartia yukonensis	yukon sandwort	Blue
Muhlenbergia glomerata	marsh muhly	Blue

Scientific Name	English Name	BC Status
Oxytropis arctica	Arctic locoweed	Blue
Oxytropis jordallii ssp. *davisii*	Davis' locoweed	Blue
Oxytropis jordallii ssp. *jordallii*	Jordal's locoweed	Blue
Oxytropis maydelliana	Maydell's locoweed	Blue
Oxytropis scammaniana	Scamman's locoweed	Blue
Pedicularis parviflora ssp. *parviflora*	small-flowered lousewort	Blue
Penstemon gormanii	Gorman's penstemon	Blue
Physaria didymocarpa var. *didymocarpa*	common twinpod	Blue
Pinguicula villosa	hairy butterwort	Blue
Pinus banksiana	jack pine	Blue
Poa abbreviata ssp. *pattersonii*	abbreviated bluegrass	Blue
Polemonium boreale	northern Jacob's-ladder	Blue
Polemonium occidentale ssp. *occidentale*	western Jacob's-ladder	Blue
Potamogeton perfoliatus	perfoliate pondweed	Blue
Potentilla biflora	two-flowered cinquefoil	Blue
Ranunculus sulphureus	sulphur buttercup	Blue
Rumex arcticus	Arctic dock	Blue
Salix petiolaris	meadow willow	Blue
Salix raupii	Raup's willow	Red
Salix serissima	autumn willow	Blue
Sarracenia purpurea ssp.. *gibbosa*	common pitcher-plant	Blue
Saxifraga hieraciifolia var. hieraciifolia	hawkweed-leaved saxifrage	Blue
Saxifraga hirculus ssp. hirculus	yellow marsh saxifrage	Blue
Senecio atropurpureus	purple-haired groundsel	Blue
Senecio congestus	marsh fleabane	Blue
Senecio sheldonensis	Mount Sheldon butterweed	Blue
Senecio yukonensis	Yukon groundsel	Blue
Silene involucrata ssp. *involucrata*	Arctic campion	Blue
Silene repens	pink campion	Blue
Silene taimyrensis	Taimyr campion	Blue
Sphenopholis intermedia	slender wedgegrass	Red
Sphenopholis obtusata	prairie wedgegrass	Red
Tofield coccinea	northern false asphodel	Blue
Trichophorum pumilum	dwarf clubrush	Blue
Woodsia alpina	alpine cliff fern	Blue

ANIMAL SPECIES

Fort St John Forest District - Halfway-Graham Pre-Tenure Plan Area

Scientific Name	English Name	BC Status
Agriades glandon lacustris	Arctic blue	Blue
Ammodramus leconteii	Le Conte's Sparrow	Blue
Ammodramus nelsoni	Nelson's sharp-tailed sparrow	Red
Asio flammeus	short-eared Owl	Blue
Bartramia longicauda	upland Sandpiper	Red
Bison bison bison	plains bison	Blue
Bolaurus lentiginosus	American bittern	Blue
Buteo platypterus	broad-winged hawk	Blue
Cygnus buccinator	trumpeter swan	Blue
Dendroica castanea	bay-breasted warbler	Red
Dendroica tigrina	cape may warbler	Red
Dendroica virens	black-throated green warbler	Blue
Grus canadensis	sandhill crane	Blue
Gulo gulo luscus	wolverine	Blue
Hesperia comma assiniboia	common branded skipper	Blue
Hiodon alosoides	goldeye	Blue
Martes pennanti	fisher	Blue
Melanitta perspicillata	surf scoter	Blue
Myotis septentrionalis	northern long-eared Myotis	Blue
Notropis hudsonius	spottail shiner	Red
Oeneis alberta	Alberta Arctic	Blue
Oeneis bore edwardsi	white-veined Arctic	Blue
Oeneis uhleri	Uhler's Arctic	Blue
Oporornis agilis	Connecticut warbler	Red
Papilio bairdii pikei	Baird's swallowtail	Blue
Phyciodes batesii	tawny crescent	Blue
Pyrgus communis	checkered skipper	Blue
Rangifer tarandus	boreal caribou	Blue
Rangifer tarandus	northern mountain caribou	Blue
Salvelinus confluentus	bull trout	Blue
Satyrium liparops	striped hairstreak	Blue
Satyrium titus titus	coral hairstreak	Blue
Speyeria aphrodite manitoba	aphrodite fritillary	Blue
Speyeria cybele pseudocarpenteri	great spangled fritillary	Blue
Ursus arctos	Grizzly bear	Blue
Vireo philadelphicus	Philadelphia vireo	Blue
Wilsonia canadensis	Canada warbler	Blue

Fort Nelson Forest District - Muskwa West Pre-Tenure Plan area

Scientific Name	English Name	BC Status
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	Red
Asio flammeus	Short-eared owl	Blue
Bison bison athabascae	Wood bison	Red
Botaurus lentiginosus	American bittern	Blue
Coregonus artedi	Cisco	Red
Coregonus autumnalis	Arctic cisco	Red
Cygnus buccinator	Trumpeter swan	Blue
Dendroica castanea	Bay-breasted Warbler	Red
Dendroica tigrina	Cape May Warbler	Red
Dendroica virens	Black-throated Green Warbler	Blue
Erebia mackinleyensis	Beringian Alpine	Blue
Grus canadensis	Sandhill crane	Blue
Gulo gulo luscus	Wolvernine	Blue
Hiodon alosoides	Goldeye	Blue
Incisalia niphon	Eastern Pine Elfin	Red
Ischnura damula	Plains Forktail	Red
Lycaena hyllus	Bronze Copper	Blue
Martes pennanti	Fisher	Blue
Melanitta perspicillata	Surf Scoter	Blue
Myotis septentrionalis	Northern Long-eared Myotis	Blue
Notropis atherinoides	Emerald Shiner	Red
Notropis hudsonius	Spottail Shiner	Red
Oeneis polixenes yukonensis	Polixines Arctic	Blue
Oeneis rosovi	Rosov's Arctic	Blue
Oporornis agilis	Connecticut Warbler	Red
Pungitius pungitius	Ninespine Stickleback	Red
Pyrgus communis	Checkered skipper	Blue
Rangifer tarandus	Caribou (boreal pop)	Blue
Rangifer tarandus	Caribou (northern mt pop)	Blue
Salvelinus confluentus	Bull Trout	Blue
Salvelinus malma	Dolly Varden	Blue
Somatochlora kennedyi	Kennedy's Emerald	Red
Stenodus leucichthys	Inconnu	Blue
Ursus arctos	Grizzly Bear	Blue
Vacciniina optilete	Cranberry Blue	Blue
Vireo philadephicus	Philadelphia Vireo	Blue
Wilsonia canadensis	Canada Warbler	Blue

APPENDIX F: RECREATION OPPORTUNITY SPECTRUM

The recreation opportunity spectrum (ROS) is an organizing framework for setting recreation management objectives. It was developed by the U.S. Forest Service and is widely used in North America. The ROS system is based on the idea that recreationists can realize desired experiences by participating in recreation activities in chosen settings. These opportunities for activities, settings and experiences range from primitive to urban. The recreation inventory includes information on existing conditions by ROS class. ROS classes are based on factors such as remoteness (access), size and evidence of human activity (naturalness). Table 1 lists the six ROS classes.

Table 1. Recreation Opportunity Spectrum Classes

Class	Roading	Remoteness	Evidence of Human Criteria
Primitive	Roadless	>8km from a 4-wheel drive road >5000 hectares	Very high probability of experiencing solitude, closeness to nature, self-reliance and challenge Unmodified natural environment Very low interaction with other people Little on-the-ground evidence of other people Restrictions and controls generally not evident Non-motorized access and travel on trails, cross-country and waterways Generally no facilities except where required for safety and sanitation Generally no site modification
Semi-primitive non-motorized	Roadless	>1 km from a 4-wheel drive road >1000 ha	High probability of experiencing solitude, closeness to nature, self-reliance and challenge Natural or natural-appearing environment Low interaction with other people Some on-the-ground evidence of other people, some on-site controls Non-motorized access and travel on trails, cross-country and waterways Facilities may be present for signing and for sanitary and safety needs using natural, rustic materials wherever possible Minimal to no site modification

Class	Roading	Remoteness	Evidence of Human Criteria
Semi-primitive motorized	Roadless	>1km from a 2-wheel drive road >1000 hectares	Moderate opportunity for solitude, closeness to nature High degree of self-reliance and challenge in using motorized equipment Natural or natural-appearing environment Low interaction with other people Some on-the-ground evidence of other people Some on-site controls Motorized access on trails, primitive roads and cross-country may occur Limited facilities for signing, sanitary and safety needs using natural, rustic materials wherever possible Minimal site modification
Roaded resource lands	Roaded	Often within 1 km of a 2-wheel drive road with a gravel or dirt surface	Opportunities for both privacy and social interaction Feelings of independence and freedom Natural environment may be substantially modified On-the-ground evidence of other people Some on-site controls Access and travel is by motorized vehicle Facilities generally present Natural, rustic materials preferred
Rural	Roaded		
Urban	Roaded		

ROS classes are determined by considering the three basic criteria of remoteness, size and evidence of humans.

Remoteness: Remoteness from the sights and sounds of human activities is used as one of the criteria for the opportunity to experience greater or lesser amounts of social interaction and primitive to rural influences as one moves across the spectrum. To identify remoteness, delineate all roads, railroads and trails on the base map or overlay. Distinguish between two levels of roads: primitive roads and better than primitive roads. Trails with motorized use are included in the primitive road category.

Road classification: For roads which are difficult to classify into the primitive road or better than primitive road categories, apply these definitions:

- Better than primitive roads are constructed and maintained for the use of highway-type vehicles having more than two wheels.
- Primitive roads are not constructed or maintained for vehicles primarily intended for highway use.

Road patterns: In most cases, all roads and trails are mapped. In areas with dense road patterns, it may not be necessary to identify each road for ROS class delineation. Based on main roads alone, the entire area may be road-influenced and become the same ROS class. In these cases, only the roads along the periphery of the densely roaded area are needed to define the Recreation Opportunity Spectrum class boundaries.

Traffic Volume: Although volume of traffic may vary widely on the better than primitive roads, depending upon the specific road involved, volume need not be recorded on the base map or overlay. The physical presence and sight of a road, even with no traffic on it, still affects the visitor experience and is accounted for through the Recreation Opportunity Spectrum criteria. If traffic volume results in sounds from a road at distances greater than the line of sight, then sound may become the determinant criterion in delineating the appropriate ROS class.

Water Travel: Where motorized water travel routes provide the only access, consider them in a manner similar to primitive roads. These specialized types of access may also provide a basis to determine the need for subclasses within the ROS continuum.

Source: *Dawson Creek Land and Resource Management Plan*, March 1999 (pp: 173-174); based on Ministry of Forests materials.